Final

Interbasin Transfer Petition

Submitted to

North Carolina Environmental Management Commission

Submitted by

Kerr Lake Regional Water System

March 2015

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Bulk Customers:

City of Henderson

Franklin County

- Bunn
- Lake Royale

Kittrell

Vance County

City of Oxford

Stovall

South Granville Water System (for Creedmoor)

Wilton

Granville County

Warren County

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Acronyms and Abbreviations

AF	acre-feet
ATC	Authorization to Construct
CA	critical area
CCTV	closed-circuit television
cfs	cubic feet per second
EA	Environmental Assessment
EIS	Environmental Impact Statement
FONSI	Finding of No Significant Impact
I&I	Inflow and infiltration
IBT	interbasin transfer
Kerr Lake	John H. Kerr Reservoir
KLRWS	Kerr Lake Regional Water System
LWSP	Local Water Supply Plan
MCLP	Mecklenburg Co-Generation Limited Partnership
MWh	Megawatt hour
MG	Million gallons
mgd	million gallons per day
MMD	average day of a maximum month
NCCGIA	North Carolina Center for Geographic Information and Analysis
NCDENR	North Carolina Department of Environment and Natural Resources
NCDMF	North Carolina Division of Marine Fisheries
NCDWR	North Carolina Division of Water Resources
NC EMC	North Carolina Environmental Management Commission
NHPNA	natural heritage program natural area
NOI	Notice of Intent
NSW	nutrient sensitive waters
O&M	operation and maintenance
ORW	Outstanding Resource Waters
RRBHM	Roanoke River Basin Hydrologic Model
SGWSA	South Granville Water and Sewer Authority
TMDL	total maximum daily load
TKN	total Kjehldahl nitrogen

TN	total nitrogen
TP	total phosphorus
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
WSRP	Water Shortage Response Plan
WWTP	wastewater treatment plant

Executive Summary

The Kerr Lake Regional Water System (KLRWS) currently provides water directly or indirectly to municipal and county systems in four counties and three river basins in northeastern North Carolina. The water supply for the system is John H. Kerr Reservoir (Kerr Lake) on the Roanoke River, and the water is used in the Roanoke, Tar-Pamlico, and Neuse River basins. This reservoir is also known as Buggs Island Lake in Virginia. It is managed by the U.S. Army Corps of Engineers (USACE) and KLRWS has an annual average day water storage allocation of 20 million gallons per day (mgd).

The owners of the KLRWS and primary bulk customers served by the system are the City of Henderson, the City of Oxford, and Warren County, known as the "Partners." Ownership responsibility is 60 percent, 20 percent, and 20 percent, respectively. They also currently sell water to secondary bulk customers that include communities in Warren, Vance, Franklin, and Granville Counties. These include Stovall, Warrenton, Norlina, Vance County, Kittrell, and Franklin County. Future sales will occur from Oxford to South Granville Water and Sewer Authority (SGWSA) for use by Creedmoor and its customer, Wilton. Franklin County now owns the Youngsville water system, is in the process of purchasing the Franklinton water and wastewater systems, and also sells water to Bunn and Lake Royale. Franklin County also obtains a small amount of additional supply from Louisburg.

The system currently produces on average 6.0 mgd of finished water. Maximum month production was 7.8 mgd in 2013 and maximum day production approached 10 mgd. In 2013, the KLRWS maximum month interbasin transfer (IBT) from the Roanoke River basin was approximately 4.6 mgd, which is below the current maximum day grandfathered IBT of 10 mgd. Recent updates to North Carolina G.S. 143-215.22L now allows IBT compliance to be measured as the daily average of a calendar month. The grandfathered IBT equivalent as calculated as the daily average of a calendar month using recent data is 9.7 mgd.

The KLRWS is requesting an IBT Certificate under Session Law 2014-120 to meet their 2045 demand projections, representing a 30-year water resources planning window. Of the water produced, some remains in the Roanoke River basin through (1) consumptive use, (2) discharge and treatment through septic systems, and (3) treatment at the City of Henderson's wastewater treatment plant and effluent discharge into Nutbush Creek, a tributary of Kerr Lake. The majority of the transferred water is to the Tar River basin, with smaller amounts transferred to the Fishing Creek subbasin in Warren County and the Neuse River basin. In 2045, the projected maximum month average day withdrawal from Kerr Lake is 17.4 mgd, which is less than the Partners' 20 mgd annual average day storage allocation in Kerr Lake, and the projected maximum month average day IBT is 14.2 mgd including:

- 10.7 mgd to the Tar River basin
- 1.7 mgd to the Fishing Creek subbasin
- 1.8 mgd to the Neuse River basin

In working toward the development of this preferred alternative of an increase in IBT, KLRWS continues to ensure continued water service to the Partners, their expanding service areas, and the local utilities that have contracts with the Partners. The following steps have been undertaken by the Partners to plan for future demands:

- Completed design and an environment assessment (EA) for Kerr Lake Regional water treatment plant (WTP) expansion (2003) and received extension on the Authorization to Construction (ATC) through December 2016
- Cooperated with USACE on a Reallocation Report after requesting a conversion from a water use agreement to a water supply storage agreement in Kerr Lake in order to increase withdrawals (2005)

- Submitted a Notice of Intent to North Carolina Environmental Management Commission (NC EMC) for increased IBT (2009)
- Prepared a Scoping Document to comply with recent IBT regulations (2009)
- As required by the 2007 general statutes, conducted public notification efforts and held five public meetings within the source basin and receiving basins of the proposed IBT to gather input from citizens in North Carolina and Virginia, community organizations, and public agencies (2009)
- Updated water demand projections to reflect 2013 statutory changes which now define measurement of IBT as the daily average of a maximum calendar month, based on 2013 LWSPs developed by the primary and secondary bulk customers of the Partners (2014)
- Included the updated water demand projections (including updates for Virginia water users) in the evaluation of impacts conducted with the updated Roanoke River basin hydrologic model (2014)
- Submitted EA which reflects 2014 statutory changes from Session Law 2014-120, which has since been codified in §143-215.22L (effective September 18, 2014), along with the Finding of No Significant Impact (FONSI) to North Carolina Environmental Review Clearinghouse (2015)
- Public hearing scheduled for March 31, 2015

The next step in the certification process is this petition submittal to the NC EMC for an IBT certificate followed by an associated public hearing and opportunity for public comment before the NC EMC rules on the petition. This petition for an IBT certificate includes the following elements in support of the request for IBT:

1. Organization of the KLRWS and the Requested Action
2. KLRWS Infrastructure
3. Present and future water supply needs of the KLRWS and its customers including consumptive and nonconsumptive uses
4. Environmental resources discussion including water quality and quantity information for the source reservoir and the receiving rivers and information on aquatic habitat for rare, threatened, and endangered species
5. Water usage data, water conservation, water efficiency, and water stewardship measures used by the KLRWS
6. Alternative sources of water to avoid or minimize an increase in IBT
7. Registered water transfers and withdrawals from the source reservoir and planned transfers or withdrawals
8. How the proposed transfer, if added to all other transfers and withdrawals within the source basin, would not reduce the amount of water available for use to a degree that would impair existing uses or existing and planned uses of the water
9. Future water supply needs within the Roanoke River basin

Introduction

1.1 Organization of the Kerr Lake Regional Water System

The Kerr Lake Regional Water System (KLRWS) currently provides water directly or indirectly to municipal and county systems in four counties and three river basins in northeastern North Carolina. The water supply for the system is John H. Kerr Reservoir (Kerr Lake) on the Roanoke River and the water is used in the Roanoke, Tar-Pamlico, and Neuse River basins. The owners of the KLRWS and primary bulk customers served by the system are the City of Henderson, the City of Oxford, and Warren County, known as the "Partners." Ownership responsibility is 60 percent, 20 percent, and 20 percent, respectively. They also currently sell water to secondary bulk customers that include communities in Warren, Vance, Franklin, and Granville Counties. These include Stovall, Warrenton, Norlina, Vance County, Kittrell, and Franklin County. Future sales will occur from Oxford to South Granville Water and Sewer Authority (SGWSA) for use by Creedmoor and its customer, Wilton. SGWSA has purchased Creedmoor's utilities and currently there is no date set for construction of an interconnection with Oxford (when appropriate, this effort would be subject to SEPA and other environmental permitting). Franklin County now owns the Youngsville water system, is in the process of acquiring ownership of Franklinton's utilities, and also sells water to Bunn and Lake Royale. Franklin County also obtains a small amount of additional supply from Louisburg (Figure 1-1).

1.2 The Requested Action

The system currently produces on average 6.0 million gallons per day (mgd) of finished water. Maximum month production was 7.8 mgd in 2013 and maximum day production approached 10 mgd. The water treatment plant (WTP) is currently rated for 10 mgd and facility expansion to 20 mgd is in the implementation stages. Matching the WTP capacity, the KLRWS has a grandfathered IBT amount of 10 mgd on a maximum day basis. Recent updates to North Carolina G.S. 143-215.22L now allows IBT compliance to be measured as the daily average of a calendar month, which based on recent plant data would be equivalent to approximately 9.7 mgd. In 2013, the KLRWS maximum month interbasin transfer (IBT) from the Roanoke River basin was approximately 4.6 mgd. Of the water produced, some stays in the Roanoke River basin through (1) consumptive use, (2) discharge and treatment through septic systems, and (3) treatment at the City of Henderson's wastewater treatment plant and effluent discharge into Nutbush Creek, a tributary of Kerr Lake.

Using Local Water Supply Plan (LWSP) data and an understanding that a portion of water is returned to the Roanoke River basin, projected maximum month IBT was calculated for the planning years of 2045 and 2060 and broken into transfer amounts to the Tar River basin, the Fishing Creek subbasin, and the Neuse River basin. In 2045, the projected maximum month average day withdrawal from Kerr Lake is 17.4 mgd and the associated IBT is 14.2 mgd including:

- 10.7 mgd to the Tar River basin
- 1.7 mgd to the Fishing Creek subbasin
- 1.8 mgd to the Neuse River basin

Predictions to 2060 include a maximum month average day withdrawal of 20.1 mgd. This corresponds to an average day withdrawal of 15.9 mgd, which is less than the Partners' 20 mgd annual average day storage allocation in Kerr Lake. After factoring in the wastewater return and consumptive use in the Roanoke River basin, average day and maximum month average day IBT out of the basin are 12.7 and 16.4 mgd, respectively. The break down by receiving basin for the predicted maximum month average day 2060 IBT is:

- 12.8 mgd to the Tar River basin
- 1.9 mgd to the Fishing Creek subbasin
- 1.8 mgd to the Neuse River basin

1.3 Background

1.3.1 Kerr Lake Allocation

The 2005 reallocation report issued by USACE approves a request by the City of Henderson for a reallocation of 10,292 acre-feet (AF) from the usable conservation pool storage at Kerr Lake for water supply storage. This report is included in an appendix of the EA. This volume corresponds to an average annual daily withdrawal of 20 mgd and is approximately 1 percent of the total conservation pool storage (980,054 AF). As a result, the total water supply storage allocation for all Kerr Lake water supply agreements increased to 21,115 AF. Reallocation finalizes the conversion of an original average annual 20-mgd "water use" agreement to a "storage agreement."

The recommendations in the USACE report state "The reallocation of storage discussed in this report is economically justified and will not significantly impact the authorized purposes of Kerr Lake. The reallocation will not require any structural or operational change" (USACE, 2005).

1.3.2 Guiding Legislation

In 2014, Senate Bill 734 was ratified as Session Law 2014-120 and includes a rewrite of G.S. 143-215.22L(w), "Requirements for Coastal Counties and Reservoirs Constructed by the United States Army Corps of Engineers." This Session Law has been codified in §143-215.22L. This section of the law allows for an expedited IBT process for Kerr Lake, a USACE-managed reservoir. Given that the USACE approved the withdrawal or transfer on or before July 1, 2014 (the deadline date listed in the statute), this process, unlike the original statute language, does not require an EIS unless it would otherwise be required by Article 1 of Chapter 113A of the General Statutes. The revised statute includes that upon NCDENR's determination that the environmental document is adequate to meet the intent of the statute and a Finding of No Significant Impact (FONSI) is prepared that NCDENR shall publish notice of the petition and hold one public hearing. After a 30-day public comment period following the public hearing and preparation of a hearing officer's report by the North Carolina Division of Water Resources (NCDWR), the NC EMC shall make a final determination whether to grant the IBT certificate.

1.3.3 Finding of No Significant Impact

The IBT request process was initiated in 2009 by filing a Notice of Intent (NOI) to the NC EMC. The NOI was signed by the three Partners, City of Henderson, City of Oxford, and Warren County. An Environmental Assessment (EA) and associated FONSI was submitted to the NC Environmental Review Clearinghouse for publication on January 23, 2015. This followed a review period for NC Department of Environment and Natural Resources (NCDENR) agencies and the U.S. Army Corps of Engineers. The U.S. Fish and Wildlife Service reviewed the EA and provided comments on March 16, 2015.

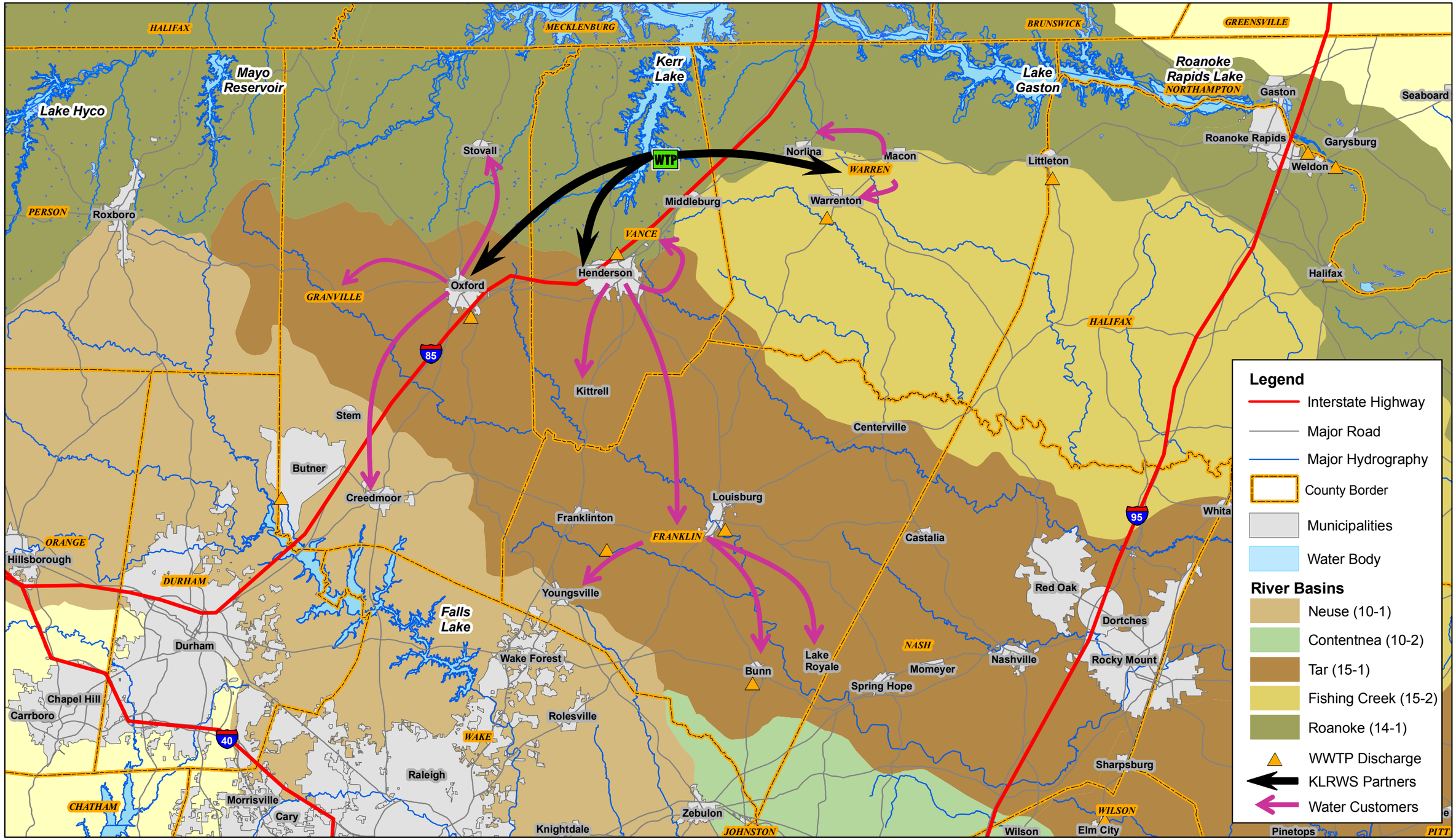

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Figure 1-1
Water Sales
Interbasin Transfer from Roanoke River Basin
Kerr Lake Regional Water System

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Description of Facilities and the Transfer of Water

2.1 KLRWS WTP and Distribution Infrastructure

The raw water intake for the KLRWS WTP is located on the Anderson Creek arm of Kerr Lake and has a capacity of 20 mgd. From the 10 mgd WTP, transmission mains convey finished water to each of the Partners. The WTP will be expanded to 20 mgd, as detailed in the ATC. The ATC expiration date has been extended to December 2016; the letter documenting this change is included in an appendix to the EA.

Finished water is then conveyed to bulk customers, as depicted in Figure 1-1. Table 2-1 presents details of each of these connections, including age of infrastructure. Given the sizes and ages of the existing infrastructure, it is not anticipated that additional conveyance capacity will be needed or that lines will need to be replaced during the planning period to 2045. Existing infrastructure connecting the WTP and the Partners' distribution systems is sufficient to meet future water demands.

TABLE 2-1
KLRWS Distribution System Infrastructure

Connection	Pipe Size (inches)	Installation Year [c]	Pipe Age (years) [d]
KLRWS to City of Henderson	24[a], 36	1974[a]	40
KLRWS to City of Oxford	20[b], 24[a], 30, 36	1974[a], 2003[b]	40, 11
KLRWS to Warren County	20, 24[a], 26	1974[a]	40

[a] 24" Pipe installed in 1974
[b] 20" Pipe installed in 2003
[d] If not noted, installation year not known
[c] Pipe age calculated in 2014

2.2 Wastewater Infrastructure

As the KLRWS is strictly a potable water provider, each Partner and their respective customers has a wastewater treatment plant (WWTP). Of the water users depicted in Figure 1-1, the City of Henderson discharges and Stovall WWTP disposes of wastewater in the Roanoke River basin. Stovall has a land application system. All other facilities discharge to other basins as part of the current IBT. Each of these facilities is currently operating under its permitted capacity and it is expected that the increases in wastewater flows predicted as part of the proposed increase in IBT can be accommodated within the limits of the existing permitted capacities. Figures 2-1 through 2-3 detail these actual (2013) and projected (2045 and 2060) water movements between basins. 2013 LWSP data were used to generate these figures.

2.3 The Transfer of Water

In total, the KLRWS is requesting an IBT certificate to transfer on an average day of a maximum month (MMD) basis 14.2 mgd out of the Roanoke River basin. All of these transfers are accounted for based on where the water is consumed or discharged. For example, water must flow through the Tar River basin to reach customers in the Neuse River basin but is accounted for as a transfer from the Roanoke River basin to the Neuse River basin. Consumptive use does occur in the Roanoke River basin as well, which does not constitute IBT. Portions of the City of Henderson, Stovall, Vance County, Granville County, and Norlina service areas are within the Roanoke River basin. This has been accounted for the in the IBT calculations presented in Figures 2-1 through 2-3. 2013 LWSP data were used to generate these figures.

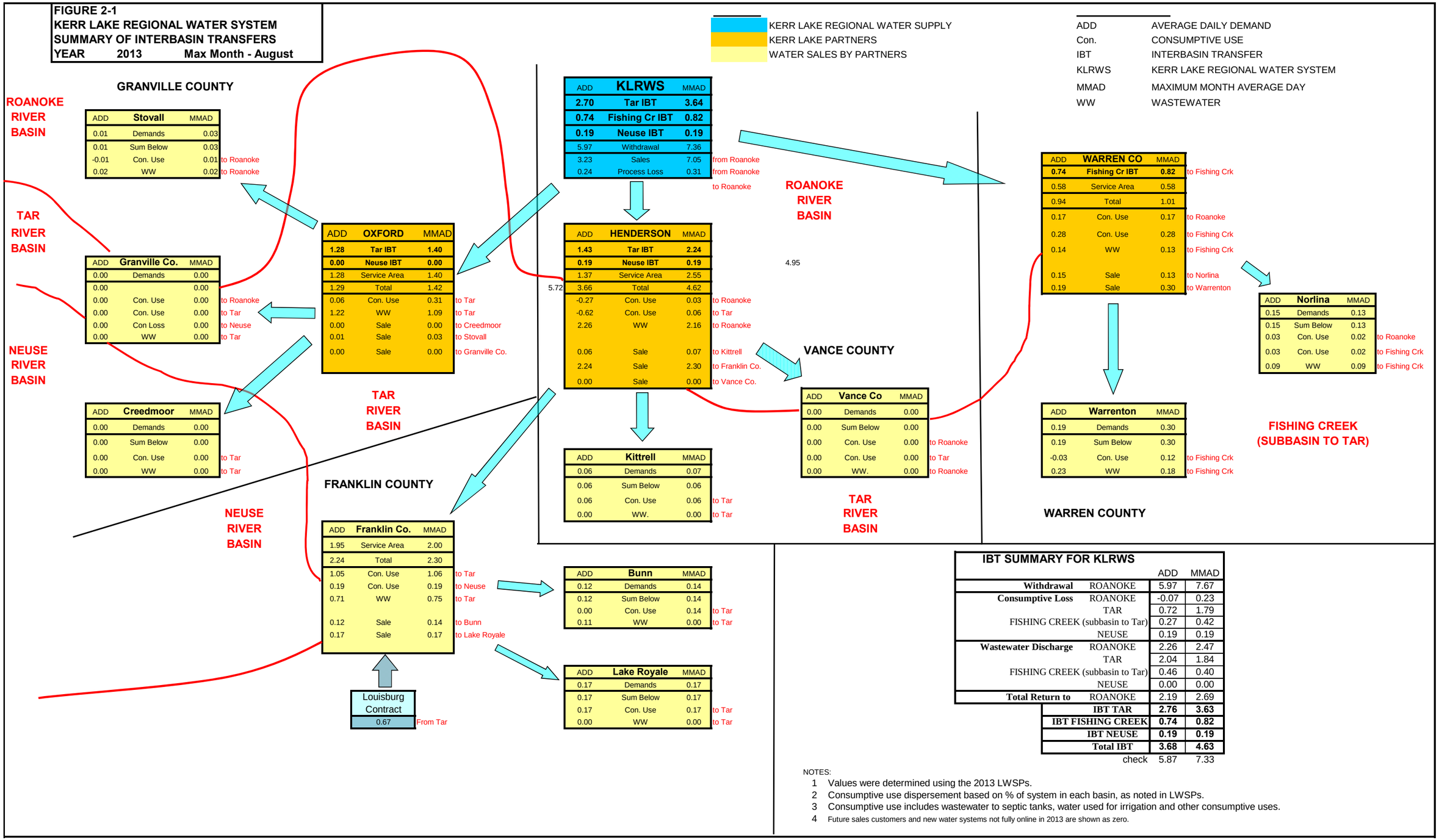
The requested IBT amount of 14.2 mgd reflects a 30-year planning period to 2045. Additional water supply planning data to 2060 are presented as a look at projected long-term water demand and supply trends.

According to 2013 LWSP data, transfers to the Tar River basin and Fishing Creek subbasin are expected to continue increasing beyond 2045. The total IBT to the Neuse River basin is not expected to measurably increase beyond 2045. This is due to the assumption that, as growth occurs in Franklin County into the future, customers would also be provided with sewer service to the extent practicable. Franklin County's wastewater system discharges to the Tar River basin, not the Neuse River basin. Therefore, a reduction in consumptive use of water in Franklin County's Neuse River basin portion of the service area could occur. This is balanced by other utilities' (SGWASA) increases in transfer to the Neuse River basin.

FIGURE 2-1
KERR LAKE REGIONAL WATER SYSTEM
SUMMARY OF INTERBASIN TRANSFERS
YEAR 2013 Max Month - August

KERR LAKE REGIONAL WATER SUPPLY
KERR LAKE PARTNERS
WATER SALES BY PARTNERS

ADD	AVERAGE DAILY DEMAND
Con.	CONSUMPTIVE USE
IBT	INTERBASIN TRANSFER
KLRWS	KERR LAKE REGIONAL WATER SYSTEM
MMAD	MAXIMUM MONTH AVERAGE DAY
WW	WASTEWATER



IBT SUMMARY FOR KLRWS

		ADD	MMAD
Withdrawal	ROANOKE	5.97	7.67
Consumptive Loss	ROANOKE	-0.07	0.23
	TAR	0.72	1.79
	FISHING CREEK (subbasin to Tar)	0.27	0.42
	NEUSE	0.19	0.19
Wastewater Discharge	ROANOKE	2.26	2.47
	TAR	2.04	1.84
	FISHING CREEK (subbasin to Tar)	0.46	0.40
	NEUSE	0.00	0.00
Total Return to	ROANOKE	2.19	2.69
	IBT TAR	**2.76**	**3.63**
	IBT FISHING CREEK	**0.74**	**0.82**
	IBT NEUSE	**0.19**	**0.19**
	Total IBT	**3.68**	**4.63**
	check	5.87	7.33

NOTES:
1 Values were determined using the 2013 LWSPs.
2 Consumptive use dispersement based on % of system in each basin, as noted in LWSPs.
3 Consumptive use includes wastewater to septic tanks, water used for irrigation and other consumptive uses.
4 Future sales customers and new water systems not fully online in 2013 are shown as zero.

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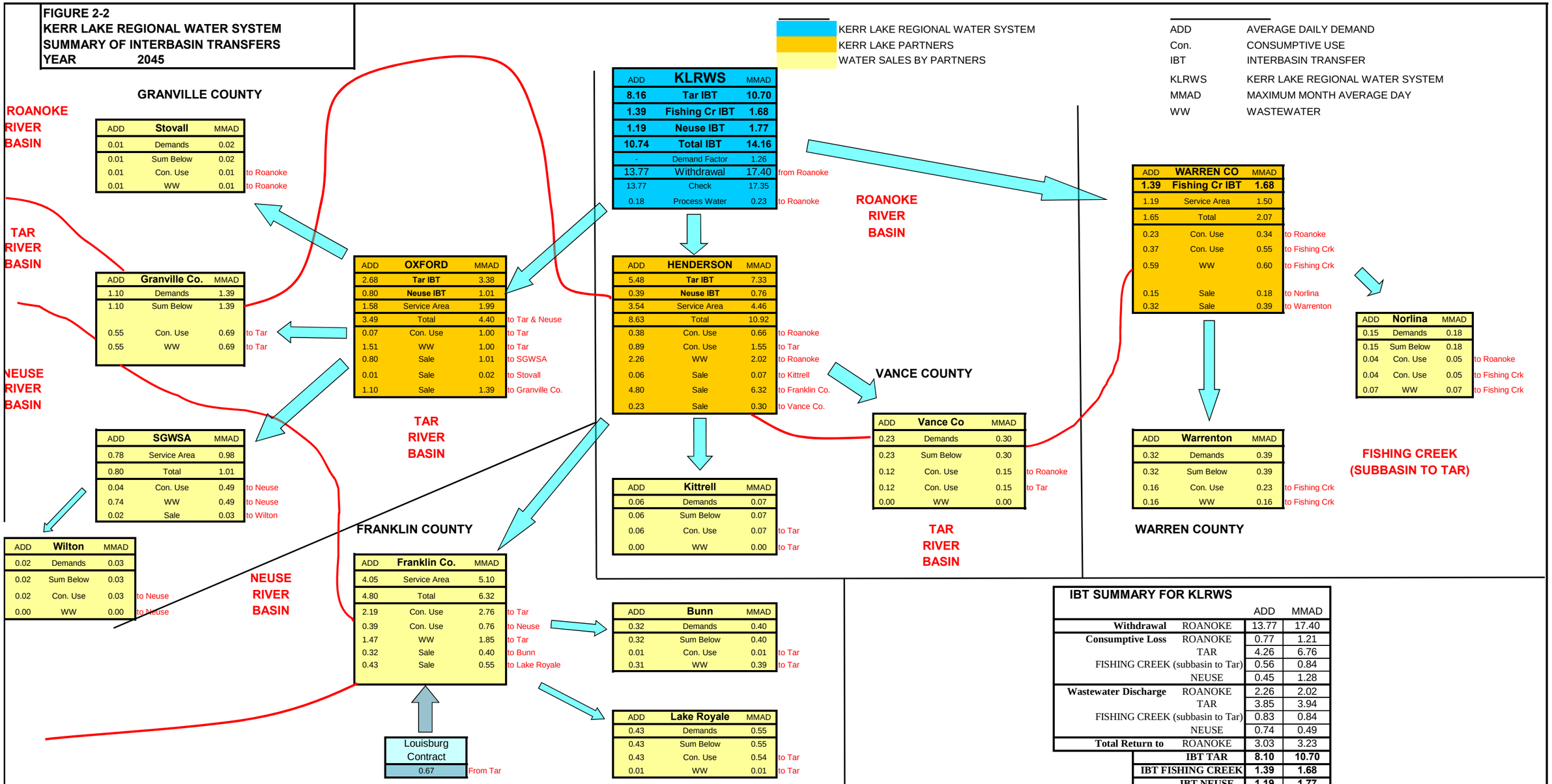
FIGURE 2-2
KERR LAKE REGIONAL WATER SYSTEM
SUMMARY OF INTERBASIN TRANSFERS
YEAR 2045

KERR LAKE REGIONAL WATER SYSTEM
KERR LAKE PARTNERS
WATER SALES BY PARTNERS

ADD	AVERAGE DAILY DEMAND
Con.	CONSUMPTIVE USE
IBT	INTERBASIN TRANSFER
KLRWS	KERR LAKE REGIONAL WATER SYSTEM
MMAD	MAXIMUM MONTH AVERAGE DAY
WW	WASTEWATER



IBT SUMMARY FOR KLRWS

		ADD	MMAD
Withdrawal	ROANOKE	13.77	17.40
Consumptive Loss	ROANOKE	0.77	1.21
	TAR	4.26	6.76
	FISHING CREEK (subbasin to Tar)	0.56	0.84
	NEUSE	0.45	1.28
Wastewater Discharge	ROANOKE	2.26	2.02
	TAR	3.85	3.94
	FISHING CREEK (subbasin to Tar)	0.83	0.84
	NEUSE	0.74	0.49
Total Return to	ROANOKE	3.03	3.23
	IBT TAR	**8.10**	**10.70**
	IBT FISHING CREEK	**1.39**	**1.68**
	IBT NEUSE	**1.19**	**1.77**
	Total IBT	**10.68**	**14.16**
	check		14.16

NOTES:
1 MMAD values were determined using a 1.260 Demand Factor, based on 2007-2013 water production data.
2 Water from Louisburg subtracted from Franklin County totals since non-KLRWS water.
3 Consumptive use dispersement based on % of system in each basin, as noted in LWSPs.
4 Consumptive use includes wastewater to septic tanks, water used for irrigation and other consumptive uses.

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FIGURE 2-3
KERR LAKE REGIONAL WATER SYSTEM
SUMMARY OF INTERBASIN TRANSFERS
YEAR 2060

LEGEND
- KERR LAKE REGIONAL WATER SUPPLY
- KERR LAKE PARTNERS
- WATER SALES BY PARTNERS

ABBREVIATIONS

ADD	AVERAGE DAILY DEMAND
Con.	CONSUMPTIVE USE
IBT	INTERBASIN TRANSFER
KLRWS	KERR LAKE REGIONAL WATER SYSTEM
MMAD	MAXIMUM MONTH AVERAGE DAY
WW	WASTEWATER

GRANVILLE COUNTY

ROANOKE RIVER BASIN

ADD	Stovall	MMAD	
0.01	Demands	0.02	
0.01	Total	0.02	
0.01	Con. Use	0.01	to Roanoke
0.01	WW	0.01	to Roanoke

TAR RIVER BASIN

ADD	Granville Co.	MMAD	
1.50	Demands	1.89	
1.50	Total	1.89	
0.75	Con Loss	0.94	to Tar
0.75	WW	0.94	to Tar

NEUSE RIVER BASIN

ADD	SGWSA	MMAD	
0.85	Service Area	1.08	
0.87	Total	1.10	
0.04	Con. Use	0.05	to Neuse
0.81	WW	1.02	to Neuse
0.02	Sales	0.03	to Neuse

ADD	Wilton	MMAD	
0.02	Demands	0.03	
0.02	Total	0.03	
0.02	Con. Use	0.03	to Neuse
0.00	WW	0.00	to Neuse

ADD	OXFORD	MMAD	
3.24	**Tar IBT**	**4.08**	
0.87	**Neuse IBT**	**1.10**	
1.74	Service Area	2.19	
4.13	Total	5.20	
0.08	Con. Use	0.10	to Tar
1.66	WW	2.09	to Tar
0.87	Sale	1.10	to SGWSA
0.01	Sale	0.02	to Stovall
1.50	Sale	1.89	to Granville Co.

TAR RIVER BASIN

FRANKLIN COUNTY

NEUSE RIVER BASIN

ADD	Franklin Co.	MMAD	
5.15	Service Area	6.48	
5.98	Total	7.53	
2.78	Con. Use	3.51	to Tar
0.49	Con. Use	0.62	to Neuse
1.87	WW	2.36	to Tar
0.40	Sale	0.51	to Bunn
0.43	Sale	0.55	to Lake Royale

Louisburg Contract	
0.67	From Tar

ADD	KLRWS	MMAD	
9.84	**Tar IBT**	**12.84**	
1.74	**Fishing Cr IBT**	**1.85**	
1.37	**Neuse IBT**	**1.72**	
	Demand Factor	1.26	
15.93	Withdrawal	20.07	from Roanoke
15.93	Check	20.07	
0.19	Process Water	0.23	to Roanoke

ROANOKE RIVER BASIN

ADD	HENDERSON	MMAD	
6.60	**Tar IBT**	**8.76**	
0.49	**Neuse IBT**	**0.62**	
3.70	Service Area	4.66	
9.97	Total	12.57	
0.40	Con. Use	0.69	to Roanoke
0.93	Con. Use	1.62	to Tar
2.36	WW	2.11	to Roanoke
0.06	Sale	0.07	to Kittrell
5.98	Sale	7.53	to Franklin Co.
0.24	Sale	0.30	to Vance Co.

ADD	Kittrell	MMAD	
0.06	Demands	0.07	
0.06	Total	0.07	
0.06	Con. Use	0.07	to Tar
0.00	WW	0.00	to Tar

TAR RIVER BASIN

ADD	Bunn	MMAD	
0.40	Demands	0.51	
0.40	Total	0.51	
0.01	Con. Use	0.02	to Tar
0.39	WW	0.49	to Tar

ADD	Lake Royale	MMAD	
0.43	Demands	0.55	
0.43	Total	0.55	
0.43	Con. Use	0.54	to Tar
0.01	WW	0.01	to Tar

VANCE COUNTY

ADD	Vance Co	MMAD	
0.24	Demands	0.30	
0.24	Total	0.30	
0.12	Con. Use	0.15	to Roanoke
0.12	Con. Use	0.15	to Tar
0.00	WW	0.00	to Roanoke

ADD	WARREN CO	MMAD	
1.74	**Fishing Cr IBT**	**1.85**	
1.36	Service Area	1.72	
1.82	Total	2.30	
0.26	Con. Use	0.39	to Roanoke
0.42	Con. Use	0.63	to Fishing Crk
0.68	WW	0.69	to Fishing Crk
0.15	Sale	0.18	to Norlina
0.32	Sale	0.40	to Warrenton

ADD	Norlina	MMAD	
0.15	Demands	0.18	
0.15	Total	0.18	
0.04	Con. Use	0.05	to Roanoke
0.04	Con. Use	0.05	to Fishing Crk
0.07	WW	0.07	to Fishing Crk

ADD	Warrenton	MMAD	
0.32	Demands	0.40	
0.32	Total	0.40	
0.19	Con. Use	0.24	to Fishing Crk
0.13	WW	0.16	to Fishing Crk

FISHING CREEK (SUBBASIN TO TAR)

WARREN COUNTY

IBT SUMMARY FOR KLRWS

		ADD	MMAD
Withdrawal	ROANOKE	15.93	20.07
Consumptive Loss	ROANOKE	0.56	0.91
	TAR	5.16	6.95
	FISHING CREEK (subbasin to Tar)	0.65	0.93
	NEUSE	0.55	0.70
WW Discharge	ROANOKE	2.36	2.11
	TAR	4.68	5.90
	FISHING CREEK (subbasin to Tar)	0.88	0.93
	NEUSE	0.81	1.02
Total Return to	ROANOKE	2.93	3.02
	IBT TAR	**9.84**	**12.84**
	IBT FISHING CREEK	**1.53**	**1.85**
	IBT NEUSE	**1.37**	**1.72**
	Total IBT	**12.73**	**16.42**
	check		16.42

NOTES:
1. MMAD values were determined using a 1.260 Demand Factor, based on 2007-2013 water production data.
2. Water from Louisburg subtracted from Franklin County totals since non-KLRWS water.
3. Consumptive use dispersement based on % of system in each basin, as noted in LWSPs.
4. Consumptive use includes wastewater to septic tanks, water used for irrigation and other consumptive uses.

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Predicted Water Demands and Uses

KLRWS is actively planning to meet its Partners' and the Partners' customers' needs for a safe, reliable water supply into the future. Using a typical 30-year water supply planning period to 2045, KLRWS shows a projected average day demand of 13.8 mgd and MMD of 17.4 mgd. This demand is based on population projections, industrial demands, service area expansion plans, planned connections to the water supply, and LWSPs developed by the customers of this regional water supplier; in other words, these demands represent both consumptive and nonconsumptive uses. The Partners provide a cost-effective solution to water supply needs for their customers and intend to continue serving as a regional supplier into the future. LWSPs are available on the NCDWR website.

In addition to serving future projected population, commercial, and industrial growth, The Partners and their wholesale customer systems are extending water service areas, obtaining new water customers who are currently served by private wells. This is non-growth related service area expansion is especially occurring in Vance and Warren Counties. Residents in Vance County have complained about the quality of their well water caused by a high mineral content, which creates taste and odor issues, and areas of groundwater contamination. These well water issues seem most concentrated in southern Vance County. To meet these future water demands, the Partners intend to increase their withdrawal from Kerr Lake in the Roanoke River basin by expanding their WTP and by obtaining an IBT Certificate beyond their current grandfathered amount.

3.1 Population Projections

According to projection data included in the LWSPs and other sources, population growth will occur at a slow rate in Vance and Warren Counties, while more rapid growth is occurring in Granville County (where Oxford is located) and Franklin County, which is in relatively close proximity to the Research Triangle area. Table 3-1 lists population projections through 2030 for each of the counties within the KLRWS service area.

TABLE 3-1
Past and Projected Annual County Population Totals

County	2000	2005	2010	2013	2015	2020	2025	2030
Franklin	47,260	53,880	60,813	62,697	63,433	66,009	68,611	71,211
Granville	48,498	53,090	57,577	57,910	59,310	61,336	63,361	65,388
Vance	42,954	43,192	45,358	45,056	45,583	45,692	45,802	45,913
Warren	19,972	20,072	20,939	20,453	20,456	20,088	19,855	19,705

Source: North Carolina Office of State Budget and Management, 2013

3.2 Average Daily Water Demands

Figure 3-1 and Table 3-2 presents average daily water demand projections through 2060. These projections reflect residential, commercial, industrial, and institutional growth projections.

FIGURE 3-1
Projected Average Daily Demands for KLRWS and Partners

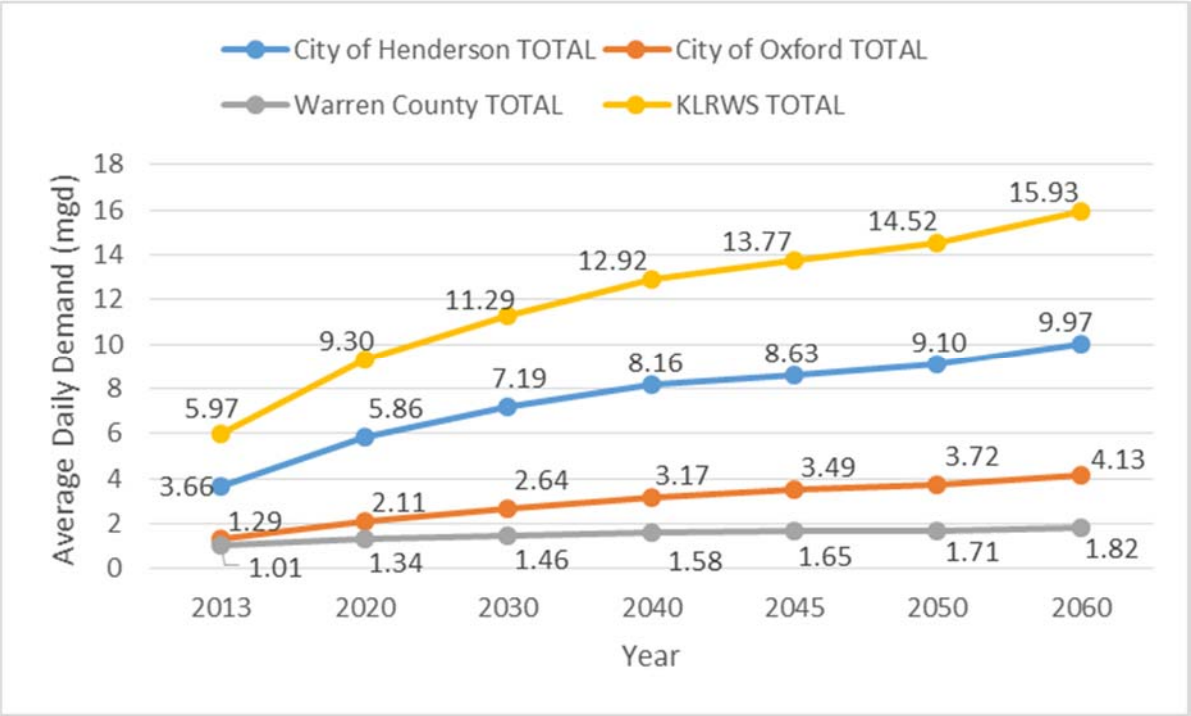

TABLE 3-2
Past and Projected Total Average Daily Demands and Sales for KLRWS (mgd)

Partner	Entity Served	2013	2020	2030	2040	2045	2050	2060
City of Henderson		1.37	2.96	3.19	3.49	3.54	3.59	3.70
	Franklin County	1.95	2.08	3.04	3.65	4.05	4.45	5.15
	Bunn	0.12	0.17	0.24	0.30	0.32	0.34	0.40
	Lake Royale	0.17	0.37	0.43	0.43	0.43	0.43	0.43
	Kittrell	0.06	0.06	0.06	0.06	0.06	0.06	0.06
	Vance County	0.00	0.22	0.23	0.23	0.23	0.24	0.24
	City of Henderson TOTAL	**3.66**	**5.86**	**7.19**	**8.16**	**8.63**	**9.10**	**9.97**
City of Oxford		1.28	1.35	1.44	1.53	1.58	1.63	1.74
	Stovall	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	Granville County	0.00	0.30	0.60	0.90	1.10	1.20	1.50
	SGWSA (for Creedmoor)	0.00	0.42	0.57	0.71	0.78	0.85	0.85
	Wilton	0.00	0.02	0.02	0.02	0.02	0.02	0.02
	City of Oxford TOTAL	**1.29**	**2.11**	**2.64**	**3.17**	**3.49**	**3.72**	**4.13**
Warren County		0.67	0.89	1.01	1.13	1.19	1.25	1.36
	Norlina	0.15	0.15	0.15	0.15	0.15	0.15	0.15
	Warrenton	0.19	0.31	0.31	0.31	0.31	0.31	0.32
	Littleton	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Warren County TOTAL	**1.01**	**1.34**	**1.46**	**1.58**	**1.65**	**1.71**	**1.82**
KLRWS TOTAL		**5.97**	**9.30**	**11.29**	**12.92**	**13.77**	**14.52**	**15.93**

Source: Data provided by KLRWS and 2013 Local Water Supply Plans

3.3 Maximum Month Average Day Water Demands

For KLRWS, the current relationship between average day demands and maximum month demands produces a demand factor of 1.26. This demand factor was conservatively calculated as the maximum ratio between WTP average annual and maximum month water use data for the period of fiscal year 2007 through fiscal year 2013 (KLRWS maintains data by July to June fiscal years). Predicted MMD water demands are presented in Table 3-3.

TABLE 3-3
Past and Projected Total MMD Demands and Sales for KLRWS (mgd)

Partner (Total Including Sales)	2013	2020	2030	2040	2045	2050	2060
City of Henderson	4.62	7.38	9.06	10.28	10.87	11.47	12.57
City of Oxford	1.63	2.65	3.32	4.00	4.40	4.68	5.20
Warren County	1.27	1.69	1.84	2.00	2.07	2.15	2.30
KLRWS TOTAL	**7.5**	**11.7**	**14.2**	**16.3**	**17.4**	**18.3**	**20.1**

Source: Data provided by KLRWS and 2013 Local Water Supply Plans, updated in 2014
Values were calculated using data in Table 2-3 with a demand factor of 1.26.

3.4 Interbasin Transfer

Based on basin boundaries and wastewater discharge locations, the KLRWS demand and IBT projections (average day of a maximum month or MMD) are summarized in Table 3-4. Figure 3-2 illustrates current and projected demands by river basin while Figures 2-1 through 2-3 provide greater detail of water movement including consumptive uses and nonconsumptive uses such as wastewater discharge into another basin.

FIGURE 3-2
Projected Average day of a Maximum Month Demands and IBT for KLRWS

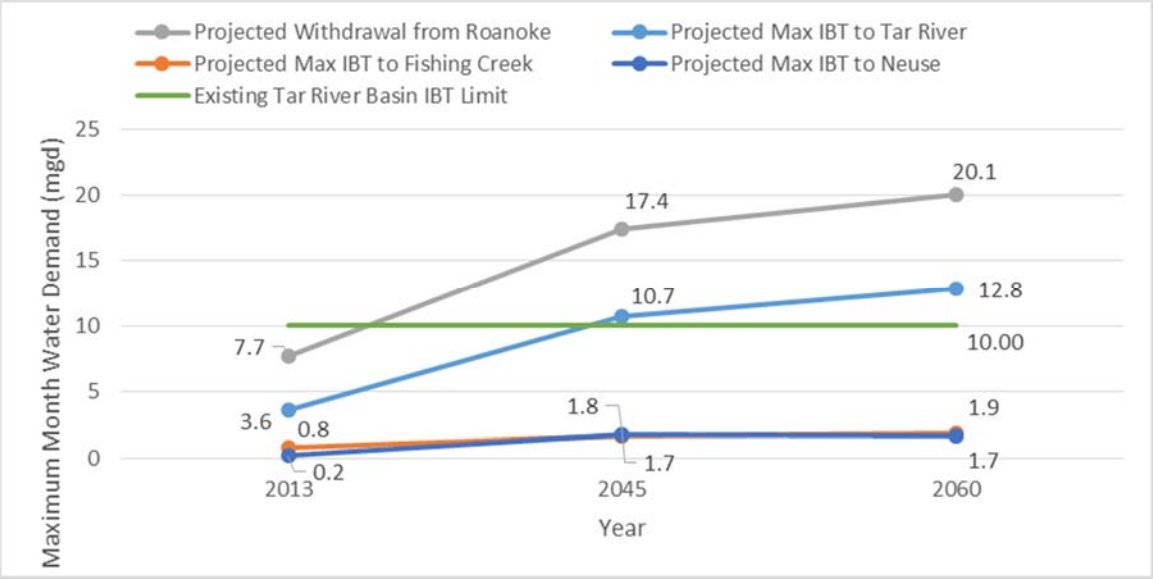

TABLE 3-4
IBT Summary for KLRWS – 2013, 2045, and 2060

		2013 (mgd)		2045 (mgd)		2060 (mgd)	
Water Usage	**Subbasin**	**ADD**	**MMD**	**ADD**	**MMD**	**ADD**	**MMD**
Withdrawal	Roanoke	6.0	7.7	13.8	17.4	15.9	20.1
Consumptive Loss	Roanoke	-0.1	0.2	0.8	1.2	0.6	0.9
	Tar	0.7	1.8	4.3	6.8	5.2	6.9
	Fishing Creek (subbasin to Tar)	0.3	0.4	0.6	0.8	0.6	0.9
	Neuse	0.2	0.2	0.4	1.3	0.6	0.7
Wastewater Discharge	Roanoke	2.3	2.5	2.3	2.0	2.4	2.1
Total Return To	Roanoke	2.2	2.7	3.0	3.2	2.9	3.0
	IBT Tar	2.8	3.6	8.1	10.7	9.8	12.8
	IBT Fishing Creek	0.7	0.8	1.4	1.7	1.5	1.9
	IBT to Neuse	0.2	0.2	1.2	1.8	1.4	1.7

Notes:
1. MMD values are defined as average day of a maximum month and were determined using a 1.26 demand factor building from on 2013 water production data.
2. Water from Franklinton and Louisburg was subtracted from Franklin County totals since it is non-KLRWS water.
4. Consumptive use includes wastewater to septic tanks, water used for irrigation, and other consumptive uses.
5. Average day consumptive loss in 2013 in the Roanoke River basin is negative and is skewed by a few wet weather events.

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Environmental Resources

Environmental resources are discussed in detail in the EA and associated FONSI published in January 2015. The FONSI is included as Appendix A to this petition. Of particular concern during the evaluation of potential impacts associated with the transfer of water from the Roanoke River basin to the Tar, Neuse, and Fishing Creek basins are water quality, water quantity, and aquatic habitat resources. Discussions provided below are focused on these environmental resources.

4.1 Water Resources

This discussion is presented first for the source basin and then for the three receiving basins.

4.1.1 Source Basin

4.1.1.1 Water Quantity and Water Supply

Water quantity in the Roanoke River basin is managed through release regimes for each of the reservoirs within the system. These release regimes include flows to maintain instream aquatic habitats including seasonal variations and water storage management for functions such as flood control and water supply storage. Reservoirs are managed by the USACE, Appalachian Power, Dominion Power, and Duke Energy. Water quantity issues related to the KLRWS withdrawal from Kerr Lake are addressed in the 2005 USACE Reallocation Report, which determined that no significant impacts would be associated with the 20-mgd water storage allocation other than a small amount of lost hydropower potential and that this water supply storage was the best alternative to meet the area's water supply needs (USACE, 2005). A list of North Carolina streams classified as water supply watersheds is included in Table 4-1.

TABLE 4-1
North Carolina Water Supply Classifications for the Roanoke River Basin

Stream Name	Classification	User
Unnamed Tributary to Dan River	WS-II	Camp Sertoma
Country Line Creek	WS-II	Town of Yanceyville
South Hyco Creek	WS-II	City of Roxboro
Storys Creek	WS-II	City of Roxboro
Anderson Creek	WS-III	KLRWS
Fullers Creek	WS-III	Town of Yanceyville
Belews Creek	WS-IV	Town of Kernersville
Dan River	WS-IV	Town of Madison and City of Eden
Mayo River	WS-IV	Town of Stoneville
Roanoke River	WS-IV	Roanoke Rapids
Smith River	WS-IV	City of Eden

Source: North Carolina Center for Geographic Information and Analysis (NCCGIA), 2014; North Carolina Division of Water Resources (NCDWR), 2013a

4.1.1.2 Water Quality

The City of Henderson discharges to Nutbush Creek, which flows into Kerr Lake and is a 303(d)-listed stream for biological impairment. The City's current NPDES permit includes a provision to allow expansion of the

discharge to 6.0 mgd; the limits in the permit are designed to preserve instream water quality. The facility has not had a violation or penalty since 2001 and thus has a long track record of compliance. Recent facility data are included in Table 4-2. Some water customers in the Roanoke River basin do not have sewer service; instead, they have on-site (septic) systems for treatment. It is expected that as water lines are extended, many customers will not be connected to sewer system given the more rural nature of the basin.

TABLE 4-2
Wastewater Discharge Characteristics in the Fishing Creek Subbasin for the Year 2014

	Average Annual Discharge	DO	BOD5 (summer)	BOD5 (winter)	Ammonia	TN	TP (summer)	TP (winter)	Nitrate/ Nitrite	TKN
	(mgd)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
Henderson										
Annual Average	2.67	8.5	1.3	3.6	0.9	21.5	0.5		21.2	0.2
Permit Limit	4.14	min. 6.0	6.0	12.0	3.0	N/A	1.0	1.5	N/A	N/A

A compilation of 303(d)-listed streams in Virginia is included in Table 4-3, which also identifies the percentage of impaired water size by water body type in the Roanoke River and its major tributaries, summarized by impairment type; the 2012 list is shown. Further details on the major impaired streams listed are shown in Table 4-5.

Table 4-4 shows the miles and acreages of impaired waters from the North Carolina 2012 list, summarized by impairment type, within the North Carolina portion of the Roanoke River basin. All waters in North Carolina are in Category 5 on the 2012 303(d) List for mercury due to statewide fish consumption advisories for several fish species. Further details on all of the listed waters in North Carolina's portion of the Roanoke River basin are shown in Table 4-6.

TABLE 4-3
2012 Impairments in the Virginia Portion of the Roanoke River Basin, Roanoke River and Major Tributaries

Impairment Type	Rivers (% of impaired water size)	Lakes (% of impaired water size)
Bacteria	87	
Benthics	18	
Mercury in Fish Tissue	12	71
PCBs in Fish Tissue	12	93
Temperature	6	
DO	3	54
DDD/DDE		<1
DDT in Fish Tissue		<1

Source: VADEQ, 2014

TABLE 4-4

Impairments in the North Carolina Portion of the Roanoke River Basin

Impairment Type	Stream (miles)	Waterbody (acres)
Aquatic Weeds		4,185
Cadmium	18.3	
Chlorophyll *a*		901.5
Copper	13.2	
Dioxin	31.6	
Ecological/Biological Integrity - Benthos	495.6	
Ecological/Biological Integrity – Fish Community	344.4	
Fecal Coliform (recreation)	212.0	
High pH		4,185
High Water Temperature		6,371.4
Low DO	28.5	
Turbidity	58.0	90.7
Water Quality Standards Aquatic Life	53.7	25,027.2
Water Quality Standards Water Supply	14.2	
Zinc	4.5	

Source: NCDWR, 2013

TABLE 4-5

303(d) Listed Waters in the Virginia Portion of the Roanoke River Basin, Roanoke River, Dan River, and Smith River

Cause Group Code	Waterbody	Impairment Cause	Miles/Acres
L03R-01-TEMP	Roanoke River	Temperature	13.08 Miles
L04R-01-HG	Roanoke River	Mercury in Fish Tissue	10.20 Miles
L42R-01-TEMP	Dan River	Temperature	15.10 Miles
L50R-01-TEMP	Smith River	Temperature	9.182 Miles
L60R-01-HG	Dan River, Banister River and Hyco River	Mercury in Fish Tissue	61.66 Miles/1,655.60 Acres
L60R-01-PCB	Dan River, Banister River and Hyco River	PCB in Fish Tissue	61.66 Miles/1,655.60 Acres

Source: VADEQ, 2014

TABLE 4-6
303(d) Listed Streams in the North Carolina Portion of the Roanoke River Basin

Assessment Unit Number	Stream or Waterbody	Parameter of Interest	Miles/Acres
23-8-(1)a	Nutbush Creek	Ecological/Biological Integrity Benthos	1.7 Miles
23-8-(1)b	Nutbush Creek	Ecological/Biological Integrity Benthos, & Ecological/Biological Integrity Fish Community	1.6 Miles
22-(1)b	Dan River	Turbidity	11.6 Miles
22-27-(1.5)	Belews Creek (Kernersville Lake)	Chlorophyll *a*	46.1 Acres
22-(38.5)	Dan River	Turbidity	0.6 Miles
22-40-(1)	Smith River	Copper	2.8 Miles
22-40-(2.5)	Smith River	Copper	0.5 Miles
22-(39)a	Dan River	Turbidity	13.8 Miles
22-40-(3)	Smith River	Copper	1.8 Miles
22-39(b)	Dan River	Turbidity	9.6 Miles
22-56-(3.5)a	County Line Creek (Farmers Lake)	Chlorophyll a, Turbidity	90.7 Acres
22-58-4-(1.4)	South Hyco Creek (Lake Roxboro)	Chlorophyll a	493.6 Acres
22-58-12-6a	Marlowe Creek	Ecological/Biological Integrity Benthos	6.6 Miles
22-58-12-6b	Marlowe Creek	Copper, Zinc, Ecological/Biological Integrity Benthos	4.5 Miles
23-10-2	Newmans Creek (Little Deep Creek)	Ecological/Biological Integrity Benthos	6.1 Miles
23-10a	Smith Creek	Ecological/Biological Integrity Benthos	6.1 Miles
23-10c	Smith Creek	Turbidity	3.0 Miles
23-30b	Quankey Creek	Ecological/Biological Integrity Benthos	3.4 Miles
23-(26)b3	Roanoke River	Low DO	17.8 Miles
26	Albemarle Sound	Dioxin	6.5 Miles

Source: NCDWR, 2013.

There are three total maximum daily load (TMDL) programs for the Roanoke River. Most recently, the Decision Rationale for the PCB TMDL was published in 2010 after PCBs were included in the 1998 303(d) list (U.S. Environmental Protection Agency [USEPA], 2010). One notable difference is the new impairment cause of PCB in the water column. The benthic TMDL for aquatic life use impairments and the bacteria TMDL for primary contact use impairment both went into effect in 2006 (USEPA, 2006a; USEPA, 2006b). When the bacteria impairment was initially listed in 1996, Virginia was using fecal coliform as the indicator. Since 2003, E. coli and enterococci have been adopted as the indicators. Other TMDLs exist for major tributaries within the Virginia portion of the Roanoke River basin; the documents can be found on the USEPA's website (USEPA, 2014).

4.1.2 Receiving Basins

4.1.2.1 Water Quantity and Water Supply

Tar River Basin

The Tar River basin contains water supply areas under the classifications of WS-II and WS-IV. Table 4-7 lists the water supply areas by classification and location. All waters in this watershed have a supplemental classification as nutrient sensitive waters (NSW). This is assigned to waters that either experience or are subject to microscopic and macroscopic vegetation growth due to the presence of excess nutrients (NCDWR, 2004); the Tar River basin is classified as NSW to protect the estuary from excessive nutrient loading. Waters at Pamlico Sound, including Swanquarter Bay Refuge, Juniper Bay and many of its tributaries, and parts of the sound itself, are classified as Outstanding Resource Waters (ORW).

TABLE 4-7
Water Supply Classifications for the Tar River Basin

Stream Name	Classification	User
Cedar Creek	WS-II NSW	City of Louisburg
Fishing Creek (Enfield)	WS-IV NSW	Town of Enfield
Hatchers Run	WS-II NSW	Town of Oxford (not in use)
Sally Kearney Creek	WS-II NSW	City of Louisburg
Tar River	WS-IV NSW	City of Greenville
Tar River	WS-IV NSW	City of Louisburg
Tar River	WS-IV NSW	Town of Oxford (not in use)
Tar River and Tar River Reservoir	WS-IV NSW	City of Rocky Mount
Tar River	WS-IV NSW	Town of Tarboro

Source: NCCGIA, 2014; NCDWR, 2013a

Note: Fishing Creek subbasin is not included in this table (see Section 4.1.1.3).

Fishing Creek Subbasin

A portion of Fishing Creek is classified as WS-IV for the Town of Enfield's water supply usage. Farther downstream, a portion is classified for the Town of Tarboro's usage. Neither is currently being used for public water supply.

Neuse River Basin

The service area portion of the Neuse River basin (southern Granville and Franklin Counties) contains water supply areas under the classification of WS-II and WS-IV, as listed in Table 4-8. All waters in the lower Neuse River basin are assigned a supplemental classification of NSW, for waters that either experience or are subject to microscopic and macroscopic vegetation growth due to the presence of excess nutrients (NCDWR, 2009a).

TABLE 4-8
Water Supply Classifications for the Eastern Tributaries to Falls Lake Portion of Neuse River Basin

Stream Name	Classification	User
Knap of Reeds Creek (Lake Butner)	WS-II NSW	Town of Butner
Ledge Creek (Lake Rogers)	WS-II NSW	City of Creedmoor
Falls Lake	WS-IV NSW	Durham, Granville, & Wake Counties

Source: NCCGIA, 2014; NCDWR, 2013a

4.1.2.2 Water Quality

The increased transfer of water to the Tar River, Fishing Creek, and Neuse basins would translate into an increase in wastewater discharges at the Oxford, Warrenton, Bunn, Franklin County, and SGWSA WWTPs. These NPDES permits were issued to protect instream water quality while allowing for flexibility with adaptive management strategies. All waters in North Carolina are in Category 5 of the 2012 303(d) List for mercury due to statewide fish consumption for several fish species.

Tar River Basin

The Tar-Pamlico River basin has a nutrient management strategy in place; Phase III is currently underway. Phosphorus and nitrogen reduction goals are the focus, with trading and other mechanisms set up to cost-effectively reduce nutrient loading. Wastewater treatment facilities within the basin currently have permits with adequate capacity for increases in wastewater generated as a result of additional water supply. These facilities have been in compliance with their permits, as summarized for 2014 in Table 4-9.

TABLE 4-9
Wastewater Discharge Characteristics in the Tar River Basin for the Year 2014

	Average Annual Discharge (mgd)	DO (mg/L)	BOD5 (summer) (mg/L)	BOD5 (winter) (mg/L)	Ammonia (mg/L)	TN (mg/L)	TP (summer) (mg/L)	TP (winter) (mg/L)	Nitrate/ Nitrite (mg/L)	TKN (mg/L)
Oxford										
Annual Average	1.231	8.0	1.2	1.0	0.29	4.4	0.16	0.1	3	1.3
Permit Limit	3.5	min. 6.0	5.0	5.0	1.0 summer; 2.0 winter	N/A	N/A	N/A	N/A	N/A
Franklin County										
Annual Average	0.762	9.2	5.0	6.6	0.91	11.6	0.71	0.55	9.25	2.37
Permit Limit [a]	3.0	min. 5.0	8.0	18.0	1.0 summer; 2.0 winter	Monitor			Monitor	Monitor

[a] Franklin County's facility is currently operating under its 1.0 mgd permit page; the facility is permitted for up to 3.0 mgd.

Table 4-10 indicates the miles and acreage of impaired waters located in the Tar River basin as included in the 2012 303(d) list, with the exception of the Fishing Creek subbasin presented in Table 4-12, summarized by impairment type. Further details on impaired stream miles listed are presented in Table 4-11.

TABLE 4-10
Summary of 303(d) Listed Waters in the Tar River Basin

Impairment Type	Stream (miles)
Ecological/Biological Integrity Benthos	47.9
Low DO	41.7
Turbidity	33.0

Source: NCDWR, 2013b

TABLE 4-11
303(d) Listed Streams in the Tar River Basin

Assessment Unit Number	Stream	Parameter of Interest	Stream (miles)
28-5a	North Fork Tar River	Ecological/Biological Integrity Benthos	5.9
28-11c	Fishing Creek	Ecological/Biological Integrity Benthos	0.9
28-11d	Fishing Creek	Ecological/Biological Integrity Benthos	1.0
28-11e	Fishing Creek	Turbidity	6.1
28-11-2	Foundry Branch	Low DO	5.5
28-(15.5)	Tar River	Turbidity	14.8
28-29-(2)b	Cedar Creek	Turbidity	12.1
29-30a	Crooked Creek	Low DO	15.1
28-30b	Crooked Creek	Low DO	5.4
28-68b	Stony Creek (Boddies Millpond)	Low DO, Ecological/Biological Integrity Benthos	5.9
28-(36)b	Tar River	Low DO	3.4
28-(64.5)	Tar River	Low DO	6.4
28-78-1(8)b1	Sandy Creek	Ecological/Biological Integrity Benthos	5.3
28-83ut8	UT to Town Creek	Ecological/Biological Integrity Benthos	2.6
28-81	Hendricks Creek	Ecological/Biological Integrity Benthos	3.9
28-87-(0.5)d	Conetoe Creek	Ecological/Biological Integrity Benthos	6.7
28-87-1.2	Ballahack Canal	Turbidity, Ecological/Biological Integrity Benthos	8.4
28-96	Greens Mill Run	Ecological/Biological Integrity - Benthos	7.3

Source: NCDWR, 2013b
UT = unnamed tributary

Fishing Creek Subbasin

The Fishing Creek subbasin, which is part of the Tar River basin and includes portions of Vance and Warren Counties, is considered a separate subbasin from the Tar River basin under IBT statute. The Town of

Warrenton's WWTP, owned by Warren County, has a capacity of 2.0 mgd; 2014 wastewater characteristics are presented in Table 4-12.

TABLE 4-12
Wastewater Discharge Characteristics in the Fishing Creek Subbasin for the Year 2014

	Average Annual Discharge (mgd)	DO (mg/L)	BOD5 (summer) (mg/L)	BOD5 (winter) (mg/L)	Ammonia (mg/L)	TN (mg/L)	TP (summer) (mg/L)	TP (winter) (mg/L)	Nitrate/Nitrite (mg/L)	TKN (mg/L)
Warren Co.										
Annual Average	0.550	9.6	0.6	3.6	0.01 summer; 2.0 winter	21.6	1.88	1.38	21.6	0.3
Permit Limit	2.0	min. 5.0	9.0	18.0	0.1 summer; 4.0 winter	N/A	N/A	N/A	N/A	N/A

As shown in Table 4-13, the 2012 list includes the mainstem of Fishing Creek due to low DO levels and an unnamed tributary to Beech Swamp for mercury and zinc.

TABLE 4-13
303(d) Listed Streams in the Fishing Creek Subbasin

Assessment Unit Number	Stream	Parameter of Interest	Stream Miles
28-79-(1)	Fishing Creek	Low DO	36.7
28-79-30ut1	UT to Beech Swamp	Water Column Mercury, Zinc	2.2

Source: NCDWR, 2013b

Neuse River Basin

SGWSA has obtained ownership of the City of Creedmoor's facilities. The facility falls under the Falls Lake Nutrient Strategy, which requires annual loading limits for nutrients. A facility upgrade and expansion is currently underway. New permit requirements, which will further reduce nutrient loading under Stage I of the Falls Lake Nutrient Strategy, will take effect on January 1, 2016.

TABLE 4-14

Wastewater Discharge Characteristics in the Neuse River Basin for the Year 2014

	Average Annual Discharge (mgd)	DO (mg/L)	BOD5 (summer) (mg/L)	BOD5 (winter) (mg/L)	Ammonia (mg/L)	TN (mg/L)	TP (summer) (mg/L)	TP (winter) (mg/L)	Nitrate/Nitrite (mg/L)	TKN (mg/L)
SGWSA										
Annual Average	1.98	8.87	2.37	2.45	0.12	4.31	0.15	0.17	3.4	0.91
Permit Limit	5.5	min. 6.0	5.0	10.0	2.0 summer; 4.0 winter	58,599 lb/year	2.0	2.0	N/A	N/A

Current Permit: TN annual mass limit: 58,599 lbs/year
2016 Permit Page: TN annual mass limit of 22,420 lb/year; TP of 2,284 lb/year

Table 4-15 indicates the miles of impaired waters located in the eastern tributaries to Falls Lake. Within this scope, only Knap of Reeds Creek and Smith Creek are listed for impairment. All waters in North Carolina are in Category 5 of the 2012 303(d) List for mercury due to statewide fish consumption for several fish species.

TABLE 4-15
303(d) Listed Streams in the Eastern Tributaries to Falls Lake Portion of Neuse River Basin

Assessment Unit Number	Stream	Parameter of Interest	Stream Miles
27-4-(6)	Knap of Reeds Creek	Zinc	5.6
27-4-(8)	Knap of Reeds Creek	Ecological/Biological Integrity Benthos	0.6
27-23-(2)	Smith Creek	Ecological/Biological Integrity Fish Community	5.8

Source: NCDWR, 2013b

The tributaries within the WS-II watersheds, including Knap of Reeds Creek, Ledge Creek, and Holman Creek, are listed as HQW. Lake Butner, Lake Rogers (Ledge Creek), and Falls Lake are listed as Critical Area (CA).

4.2 Aquatic and Wildlife Habitat and Resources

Federally listed species known to occur in the project service area are included in Table 4-16. In addition, many natural heritage program natural areas (NHPNA) have been identified, many of which provide habitat for state and/or federally listed species. Detailed discussion of aquatic and wildlife habitat and resources is provided in the associated EA (CH2M HILL, 2015).

4.2.1 Source Basin

Several federally listed species are known to occur in the source basin in Virginia and North Carolina. Fishing, especially for striped bass and shad, is also an important recreational and commercial activity in the Roanoke River basin. In addition, one NHPNA is present in the Granville County portion of the source basin. The proposed project would not likely have any direct effects on these federally listed species or their habitats in Kerr Lake, as no construction would occur and there are no known occurrences of aquatic protected species near the water withdrawal location. In addition, no discernable water quality or quantity impacts result from the proposed transfer of water. With no construction and no discernable changes

predicted, the upstream NHPNA in Granville County and the downstream Roanoke River Management Area for striped bass are not expected to be directly impacted by the proposed project. The NCWRC will continue to manage this fishery and its open seasons. The NC Division of Marine Fisheries (NCDMF) also has developed and is implementing fisheries management plans for anadromous fish in the Roanoke River basin (NCDMF, 2015).

4.2.2 Receiving Basins

Several listed freshwater mussel and fish species are federally listed in the Tar and Neuse River basins. The aquatic communities, especially in the Tar River basin, exhibit many rare species. In turn, many lengths of stream have been designated as NHPNAs in the Tar River basin.

The Fishing Creek watershed contains diverse aquatic species, and its biological ratings have generally been assessed as good and excellent. The NCWRC has recognized it as a priority area for habitat protection, but there are no waters currently classified as HQW or ORW (NCDWR, 2010b).

TABLE 4-16
Federally Listed Aquatic Species within the Service Area

Common Name	Scientific Name	Federal Status	Watershed (Roanoke, Tar, Neuse)	County [a]	County Status [a]
Vertebrates					
American Eel	*Anguilla rostrata*	FSC	All [a]	Franklin, Granville, Vance, Warren	Current
Carolina Darter	*Etheostoma collis lepidinion*	FSC	Neuse, Tar [b]	Granville, Vance	Current
Carolina Madtom	*Noturus furiosus*	FSC	Tar, Neuse [c]	Franklin, Granville, Vance	Current
Neuse River Waterdog	*Necturus volucellus*	FSC	Neuse, Tar [b]	Franklin, Vance, Warren	Current
Pinewoods Shiner	*Lythrurus matutinus*	FSC	Neuse, Tar [c]	Franklin, Granville, Vance, Warren	Obscure
Roanoke Bass	*Ambloplites cavifrons*	FSC	All [c]	Franklin, Granville, Warren	Current
Invertebrates					
Atlantic Pigtoe	*Fusconaia masoni*	FSC	All [c]	Franklin, Granville, Warren	Current
Brook Floater	*Alasmidonta varicosa*	FSC	Roanoke [c]	Granville	Current
Chowanoke Crayfish	*Orconectes virginiensis*	FSC	Roanoke [a]	Granville	Current
Dwarf Wedgemussel	*Alasmidonta heterodon*	E	Tar [c]	Franklin, Granville, Vance, Warren	Current
Green Floater	*Lasmigona subviridis*	FSC	Tar [c]	Granville	Current
Mountain River Cruiser	*Macromia margarita*	FSC	All	Franklin, Granville	Current
Tar River Spinymussel	*Elliptio steinstansana*	E	Tar, Neuse [c]	Franklin, Warren	Current
Yellow Lampmussel	*Lampsilis cariosa*	FSC	Tar [c]	Franklin, Granville, Vance	Current
Yellow Lance	*Elliptio lanceolata*	FSC	Tar [c]	Franklin, Granville, Vance, Warren	Current

[a] USFWS, 2014a
[b] NCNHP, 2014
[c] NCWRC, 2014

E = Endangered
FSC = Federal Species of Concern

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Water Usage Data and Water Conservation

The Partners desire to minimize environmental impacts while meeting their water supply needs; in addition, selecting alternatives that have lower environmental impacts meets the requirements of federal and state environmental legislation.

5.1 Water Usage

While water conservation programs can reduce the IBT, they likely cannot eliminate the need for an IBT. KLRWS supplies little irrigation water, as evidenced by their relatively low peak day to average day ratio (peaking factor) of 1.3 (compared with many urban/suburban systems that have peaking factors of 1.5 and above as a result of a combination of seasonal cooling demands for commercial/industrial customers and irrigation demands). For KLRWS, the current relationship between annual average day demands and average day in a maximum month demands produces a demand factor of 1.26. This demand factor was conservatively calculated as the maximum ratio between WTP average annual and average day in a maximum month water use data for the period of fiscal year 2007 through fiscal year 2013 (KLRWS maintains data by fiscal year). Irrigation water demands in the service area comprise a very low percentage of the KLRWS's total water demands. While the majority of the KLRWS water demands are residential, existing residential development is olderand irrigation systems are not as common as in more recently developed, subdivided areas. Customers will be added as water service is extended to current individual groundwater well water users in Vance, Granville, and Warren Counties. While recent and future residential development is more likely to include irrigation, it is not predicted that the demand factor will increase over time. Also, conservation efforts and programs to minimize water system losses (as discussed in this section and Section 6) would aid in minimizing the likelihood of a rise in the demand factor over time. Therefore, this 1.26 demand factor was used to predict future maximum month demands to 2060.

5.2 Water Shortage Response Plan

KLRWS has developed a Water Shortage Response Plan (WSRP) that was agreed to by the Partners, the City of Henderson, the City of Oxford, and Warren County in 2011 (Ordinance Book 8, Ordinance 11-04, Chapter 15B). The purpose of the plan, which is included in Appendix B, is to declare official phases of water supply shortage and voluntary and mandatory conservation measures for those phases. Enforcement measures are also included. The plan applies to the three Partners; each of which would notify their employees and customers (including wholesale) of the water shortage phase and corresponding conservation measures. Each wholesale customer must comply with the same measures. These plans have been approved by NCDWR and are available on their website.

5.3 Water Use Reduction Measures

The KLRWS is planning multiple efforts to reduce water loss in the distribution system. The expansion of the WTP will also include improvements to the treatment process. These improvements are aimed in part to reduce the volume of water needed for system flushing. This will reduce non-revenue water loss. The KLRWS also encourages good water stewardship through public education efforts including on its website. The program suggests ways customers can prevent and detect water leaks and ways to limit water consumption through actions such as installing water-saving devices.

The City of Henderson conducted a study of unaccounted for water to incorporate projects that reduce water loss in its future capital planning. After removing non-revenue water, the system loss was calculated as 3.4 percent during the 2013 to 2014 fiscal year. Unaccounted for and nonrevenue water are tracked monthly and meter replacements are occurring. These measures will increase the system's efficiency and continued stewardship of its water supply.

The City of Oxford is also taking steps to reduce water loss. In addition to regular tracking of unaccounted for water, a valve mapping and installation program is now underway to install additional water valves in the City's system. This is particularly valuable in the reduction of water loss during situations such as water line breaks. Areas can be more quickly isolated, repairs made, and service restored while minimizing water loss. Meters improvements are also being made, with replacements first targeted for larger commercial users. The function of the master meter at the transfer point from the KLRWS to the City of Oxford has also been improved. In addition, a large water user meter audit is underway by an outside firm and the City is prepared to make corrections as needed to improve data accuracy. The City has also partnered with the North Carolina Rural Water Association for leak detection and will continue to do so as needed.

Warren County actively tracks its water use and water system losses through monthly auditing of water usage and distribution data. Through this effort, a monthly zero consumption report is prepared to identify meters that may need repair or replacement. Water losses, both nonrevenue and unaccounted for, are reviewed and actions are taken to reduce losses as needed.

5.4 Water Stewardship Efforts

Both water demand management and water quality protection efforts are underway in the service area. Combined, these efforts demonstrate the water stewardship efforts of the KLRWS and its Partners.

The City of Henderson's investment in upgrades to its WWTP is underway; construction of the expansion and associated treatment process improvements is near completion. In addition to investments made at the WWTP, the City has an ongoing inflow and infiltration (I&I) identification and corrections program. Maintenance staff inspect manholes and sewer lines to identify areas where stormwater may be entering the collection system and make needed improvements using funds appropriated in the capital improvements budget. The City has invested in a truck with closed-circuit television (CCTV) equipment to view the inside of sewer lines in order to identify needed repairs efficiently and funds an ongoing effort to limit tree root growth associated I&I issues and overflows.

The City of Oxford is currently investing in collection system and WWTP improvements that will benefit water quality. The City continues to implement repair projects from its 1999 inflow and infiltration (I&I) study through its capital improvement plan. Other projects are aimed at reducing I&I into the collection system where road flooding associated with stormwater issues enters sewer system manholes. The funding for this program is coming from its stormwater utility fee, which is allowing the City to switch from a reactionary approach to I&I to more of a proactive program. At the City's WWTP, a flow equalization basin is currently being constructed. This 1 million gallon (MG) holding basin will function to temporarily store influent so that it can be slowly fed into the WWTP, improving the facility's operation and treatment capabilities at peak flow wet weather events. These investments in the City's infrastructure will lead to water quality benefits especially during wet weather events.

Warren County's WWTP, operated by the Town of Warrenton, has been operating well below its permitted concentration limits, as discussed earlier in Section 4, including with regard to ammonia and other effluent characteristics that have the potential to impact aquatic life. Continued performance of the facility is important, as Warren County recognizes the high quality resources in Fishing Creek. The sewer system is also being expanded, reducing the number of septic systems in the watershed. This will also aid in the protection of water resources.

Water Supply and Interbasin Transfer Alternatives

The general categories of alternatives to IBT include managing water demand, identifying water supplies in the receiving basins, and returning water to the source basin. The Partners desire to minimize environmental impacts while meeting their water supply needs; in addition, selecting alternatives that have lower environmental impacts meets the requirements of federal and state environmental legislation. These alternatives were selected to meet the requirements of the IBT rules (NCGS 143-215.22L) and to address comments received during the scoping process. Alternatives were screened, based on the following criteria:

- Ability to meet 2045 water supply needs – alternatives which do not meet these water supply needs were eliminated from further consideration, as they do not meet the project purpose and need.
- Environmental considerations – alternatives which were likely to have a significant impact on environmental resources in comparison with other alternatives were eliminated from further consideration. Water resources impacts are of particular focus and could include impacts to water supply in the Roanoke River basin, impacts to aquatic resources in the source and receiving basins, and impacts to hydropower generation in the Roanoke River basin.
- Cost considerations – the no action alternative and the alternative including IBT have essentially no costs since little or no new infrastructure is proposed. The proposed WTP expansion will be constructed regardless of the selected alternative, although sizing may be revisited if the no action alternative were to move forward. Treatment process improvements would still occur. Costs for the WTP expansion are accounted for in the Partners' rate model and budget. Costs are therefore compared among the other alternatives. Alternatives that have costs significantly higher than other alternatives to the proposed project were not selected as the preferred alternative in part because these alternatives would not meet the KLRWS purpose of being fiscally responsible to their customers. Existing distribution and wastewater treatment infrastructure would remain for all alternatives; thus operation and maintenance (O&M) costs to maintain existing infrastructure would be identical under all alternatives.

Table 6-1 summarizes each of the project alternatives. Note that the planned WTP expansion is necessary regardless of the selected alternative and therefore is not accounted for in the assessment of new infrastructure requirements. Cost estimates were performed at a high level; detailed cost analysis and comparison has not been conducted for the various alternatives presented. As such, cost ranges are presented.

Based on the analyses above, Alternative 2 was selected as the preferred alternative. The rationale for this selection instead of other technically feasible but more costly options can be summarized as follows:

- Alternative 1 - No Action Alternative – While this alternative does not meet the project purpose and need, it is a requirement of the North Carolina SEPA to review this alternative.
- Alternative 2 – Increase IBT – This option meets the stated purpose and need, is within the USACE 20 mgd water storage allocation in Kerr Lake and is evaluated in this EA.
- Alternative 3c – Minimize IBT by finding an alternative water supply source with offline storage in the Tar-Pamlico River basin. This alternative meets the purpose and need, but would result in higher wetland and stream impacts compared to the proposed project; this alternative could impact federally listed species in the Tar-Pamlico River basin.
- Alternative 5 – Minimize IBT by discharging treated wastewater back to the Roanoke River basin. This alternative would meet the stated purpose and need. This alternative would require more piping infrastructure than the proposed project, and thus may have greater construction-related wetland and stream impacts.

The other alternatives do not meet the screening criteria established at the beginning of this section. They either did not meet 2045 water supply needs, had much higher environmental impacts than other alternatives, had costs that were significantly higher than other alternatives to the proposed project, or some combination of the above.

In addition to the alternatives considered in the EA, G.S. 143-215.22L includes language requiring the consideration of reinjection storage as a water source. Reinjection storage and recovery typically involves the injection of treated effluent to support the replenishment of aquifer storage. This practice is more common in the coastal plain than in the piedmont. Given the geographic spread of the service area across multiple river basins, significant infrastructure investment would be needed in multiple locations to construct reinjection storage. In addition, the current water distribution systems would need significant re-working and additional water treatment capabilities would be needed to meet water demands. The regional solution of IBT presented here offers much more water supply reliability than the use of reinjection storage and recovery.

TABLE 6-1
Summary of Alternatives

Alternative	Meets Purpose and Need?	Increase Allocation from Kerr Lake?	Requires New Infrastructure?	Potential Environmental Impacts	Planning Level Capital Cost for KLRWS (2015 Dollars)[1]
1. No Action	No	No	No	Insignificant environmental impacts; growth would still occur and private wells would be constructed to meet needs	$0
2. Increase IBT to Meet Needs of KLRWS	Yes	No	No	No significant environmental impacts to water resources in the Roanoke River basin (water supply, lake levels, hydropower) per modeling results	$0
3a. Avoid additional IBT by using a surface water withdrawal from the Tar River basin	No	No	Yes	Significant environmental impacts to aquatic habitat and species on the Tar River as the recommended instream passing flow would not be met	Not evaluated since adequate water would not be provided under this alternative
3b. Avoid additional IBT by constructing a new water supply reservoir on the Tar River	No	No	Yes	Significant environmental impacts to flow regime, wetlands, and aquatic habitat and federally listed species, from reservoir construction and a limited instream passing flow	Eliminated due to environmental impacts and potential for inadequate water
3c. Avoid additional IBT by using a water withdrawal with offline storage in the Tar River basin	Yes	No	Yes	Environmental impacts to the flow regime on the Tar River include aquatic habitat and federally listed species, and impacts to wetlands may result from offline storage	Storage cost alone could exceed $540 million (1 order of magnitude higher than Alternative 5)
4. Avoid additional IBT by using groundwater	No	No	Yes	Environmental impacts from new wellfields include those to the slowly renewable groundwater resources; impacts to water supply, hydropower, and lake level in the Roanoke River basin are less significant than those from the proposed project	Cost not evaluated since adequate water would not be provided under this alternative
5. Minimize IBT by discharging wastewater to Roanoke River basin	Yes	No	Yes	Direct environmental impacts would result from new linear infrastructure and impacts to water resources and hydropower would result from some loss of water from the Roanoke River basin, however, these would not be as significant as the IBT	$17,030,000 to $111,400,000 depending on number of treatment plants used to transfer effluent back to Roanoke River basin

TABLE 6-1
Summary of Alternatives

Alternative	Meets Purpose and Need?	Increase Allocation from Kerr Lake?	Requires New Infrastructure?	Potential Environmental Impacts	Planning Level Capital Cost for KLRWS (2015 Dollars)[1]
6a. Avoid additional IBT by using Pamlico Sound as source	No	No	Yes	Significant direct environmental impacts due to linear infrastructure and using coastal estuary water including land use, wetlands, and aquatic and terrestrial resources, among others	$820,000,000 - $910,000,000 (order of magnitude higher than Alternative 5)
6b. Avoid additional IBT by using groundwater from coastal area	No	No	Yes	No significant environmental impacts to water resources in the Roanoke River basin (water supply, lake levels, hydropower) per modeling results	$680,000,000 - $886,800,000 (order of magnitude higher than Alternative 5)

Note:

Costs are approximate only and have been included for high-level planning purposes. (in 2015 dollars)

[1]The cost of reallocation on hydropower is approximately $3,455,000 (2005 dollars). The KLRWS is currently compensating the USACE annually for the lost hydropower.

Water Transfers and Withdrawals from the Source Basin

The Roanoke River basin stretches from Virginia to North Carolina and includes many public water systems and registered water withdrawals. Other uses such as agriculture also occur. To meet the requirements of G.S. 143-215.22L, the following tables list these North Carolina registered systems as provided in the updated NCDWR Roanoke River Basin Hydrologic Model (RRBHM) (Hydrologics, 2014). There are no current NC IBT certificates in the basin; KLRWS holds a grandfathered IBT amount of 10 mgd on a maximum day basis. Table 7-1 lists the public water systems while Table 7-2 lists all registered water withdrawals. Virginia does not regulate IBT but there is a transfer of 60 mgd from Lake Gaston for Virginia Beach and some smaller water transfers in the upper portion of the basin.

Other public water systems and withdrawals occur in the Virginia portion of the Roanoke River basin. Several entities in addition to KLRWS hold existing water supply agreements to use Kerr Lake as a water source:

- Town of Clarksville, Virginia
- City of Virginia Beach, Virginia
- Virginia Department of Corrections, Virginia
- Mecklenburg Co-Generation Limited Partnership (MCLP), Virginia
- Burlington Industries, Virginia (facility closed in 2005)

TABLE 7-1
Public Water Systems in the North Carolina portion of the Roanoke River Basin

Public Water System ID	System Name	System Owner	Water Source Name
0217010	Town of Yanceyville	Town of Yanceyville	Farmer Lake
0217010	Town of Yanceyville	Town of Yanceyville	Fuller's Creek
0273010	City of Roxboro	City of Roxboro	City Lake
0273010	City of Roxboro	City of Roxboro	Lake Roxboro
0273409	Roxboro Steam Plant	Duke Energy	Hyco Lake
0279010	Town of Eden	Town of Eden	Dan River
0279025	Town of Mayodan	Town of Mayodan	Mayo River
0279030	Town of Madison	Town of Madison	Dan River
0291010	Henderson-Kerr Lake Regional Water	City of Henderson, City of Oxford, and Warren County	Kerr Lake
0442010	Roanoke Rapids Sanitary District	Roanoke Rapids Sanitary District	Roanoke River
0442010	Roanoke Rapids Sanitary District	Roanoke Rapids Sanitary District	Roanoke Rapids Lake
0442020	Weldon Water System	Town of Weldon	Roanoke River

TABLE 7-2
Registered Water Withdrawals in the North Carolina portion of the Roanoke River Basin

ID	Owner Name	Facility Name	County
0057-0013	Duke Energy Carolinas, LLC	Belews Creek Steam Station	Stokes
0218-0013	Aqua North Carolina	Applegate	Forsyth
0218-0015	Aqua North Carolina	Bethel Forest	Forsyth
0218-0055	Aqua North Carolina	Bexley Place	Forsyth
0218-0058	Aqua North Carolina	Bishops Ridge	Forsyth
0218-0150	Aqua North Carolina	Deer Path	Forsyth
0218-0218	Aqua North Carolina	Graystone Forest	Forsyth
0218-0310	Aqua North Carolina	Kynwood	Forsyth
0218-0366	Aqua North Carolina	Mikkola Downs	Forsyth
0218-0439	Aqua North Carolina	Pine Knolls	Forsyth
0218-0521	Aqua North Carolina	Smokerise	Forsyth
0218-0572	Aqua North Carolina	Stoney Point – Forsyth	Forsyth
0378-0093	Utilities, Inc.	Abington	Forsyth
0218-0048	Aqua North Carolina	Belews Landing	Rockingham
0218-0096	Aqua North Carolina	Cedar Hollow	Rockingham
0218-0717	Aqua North Carolina	Collybrooke	Rockingham
0218-0371	Aqua North Carolina	Mineral Springs	Rockingham
0218-0455	Aqua North Carolina	Quail Oaks	Rockingham
0218-0464	Aqua North Carolina	Richwood Acres	Rockingham
0218-0470	Aqua North Carolina	Ridgeway Courts	Rockingham
0745-0001	Deep Springs Country Club	Deep Springs Country Club	Rockingham
0057-0010	Duke Energy Carolinas, LLC	Dan River Steam Station	Rockingham
0219-0046	Martin Marietta Materials, Inc.	Reidsville Quarry	Rockingham
0755-0001	Mitchell Wilson	Lynrock Golf Course	Rockingham
0218-0354	Aqua North Carolina	Meadow Ridge – Guilford	Guilford
0218-0555	Aqua North Carolina	Sprinkle	Caswell
0819-0001	CertainTeed Gypsum NC	CertainTeed Gypsum Roxboro Plant	Person
0033-0009	Duke Energy Carolinas	Mayo Electric Generating Plant	Person
0033-0008	Duke Energy Carolinas	Roxboro Steam Electric Plant	Person
0668-0001	Roxboro Country Club	Roxboro Country Club	Person
0218-0380	Aqua North Carolina	Mountain Creek	Granville
0199-0022	Vulcan Construction Materials, L.P.	Greystone Quarry	Vance
0064-0001	Fate B. Everett, Jr.	Fate B. Everett, Jr.	Halifax

TABLE 7-2
Registered Water Withdrawals in the North Carolina portion of the Roanoke River Basin

ID	Owner Name	Facility Name	County
0037-0001	Kapston Kraft Paper Corp.	Roanoke Rapids Mill	Halifax
0348-0001	North Carolina Dept. of Correction	Enterprise Farms	Halifax
0207-0001	Johnston Farm	Johnston Farm	Northampton
0104-0005	Brinkley Farms, Inc.	Marmaduke Farm	Bertie
0244-0002	Horace Ward, Jr.	Ward Farms	Bertie
0244-0003	Horace Ward, Jr.	Ward Farms	Bertie
0244-0004	Horace Ward, Jr.	Ward Farms	Bertie
0244-0005	Horace Ward, Jr.	Ward Farms	Bertie
0244-0006	Horace Ward, Jr.	Ward Farms	Bertie
0244-0007	Horace Ward, Jr.	Ward Farms	Bertie
0372-0001	Bryant Bros., Inc.	Bryant Bros., Inc.	Bertie
0325-0001	Harden Farms Inc.	Harden Farms	Bertie
0230-0001	Perdue Farms, Inc.	Lewiston	Bertie
0343-0001	Ted Winslow	Ted Winslow Farm	Bertie
0822-0001	EWM, LLC	Bent River Materials	Bertie
0822-0001	EWM, LLC	Bent River Materials	Bertie

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Impacts Analysis for the Proposed Transfer

Direct impacts to the Roanoke River basin from the increase in water transfer from the basin were evaluated by using the updated NCDWR Roanoke River Basin Hydrologic Model (RRBHM). A hydrological model for a river basin can be used to assess changes in hydrological indicators for current and future conditions based on a time series of hydrological inputs to the basin. Key indicators that the model can estimate are river flows at various points within the river basin, reservoir water levels, and changes in hydroelectric power generation. These indicators can be used to evaluate and/or describe various potential environmental and economic impacts related to key issues identified during scoping. These potential impacts can be summarized as follows:

- Reduced water for downstream fisheries and recreation
- Inability of communities to obtain future water supply for growth
- Reduced lake property values from altered aesthetics or access related to lower water levels
- Impacts to recreation and tourism due to lower water levels
- Precedent setting, such that other communities could transfer water from the basin

All except the last of these potential impacts can be evaluated based on the results generated using the updated RRBHM (Hydrologics, 2014). The last issue is a policy question for the EMC and NCDWR.

The updated RRBHM was used to evaluate changes in indicators for the following alternatives:

- 2010 Baseline – IBT is about 4.6 mgd
- 2045 Baseline – Includes grandfathered IBT amount (10 mgd)
- 2045 IBT – IBT increases to 14.2 mgd
- 2060 Baseline – Includes grandfathered IBT amount (10 mgd)
- 2060 IBT – IBT increases to 17.3 mgd

A full discussion of the use of the RRBHM and modeling outcomes is presented in Appendix D of the EA.

8.1 Lake Level

Lake level estimates are fairly insensitive to changes in demand due to the large inflows from the watershed and volume of the reservoir. Changes to elevation are relatively insensitive even during drought periods but show the largest change due to overall increase in demand in comparing the 2010 to 2045 Baseline results.

Table 8-1 summarizes the average changes in elevation during the simulation period and during the two extreme drought periods in the 2000s for three reservoirs in the Roanoke system: Kerr Lake, Lake Gaston, and Roanoke Rapids Reservoir. Figure 8-1 details lake level changes in Kerr Lake during the 2002 drought. None of the reservoirs showed a discernible difference in elevation between the 2045 baseline and IBT 2045 scenarios during the 2002 and 2007 droughts.

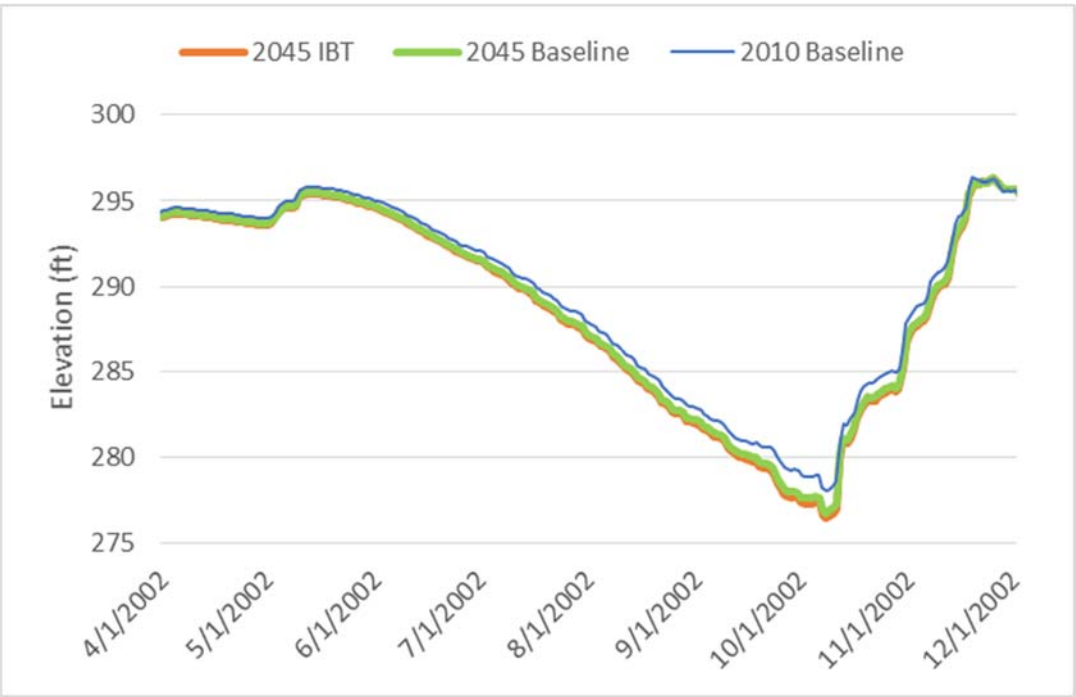
Kerr Lake was the only reservoir that showed any differences, albeit slight, during the exceptional drought periods. The model runs simulate the operation of the reservoirs based on the guide curves specified for each reservoir. This operational mode tends to maintain the reservoir level by regulating releases. For this reason, average lake elevation is usually the same for the different scenarios. In the case of the 2002 drought, Kerr Lake did show a slight difference in elevation of 0.2 feet. Because of the drought, the elevation falls below the guide curve, and the discharge is maintained at the same elevation for the IBT and non-IBT. This results in a slightly lower elevation in the IBT scenario.

Modeling results for other reservoirs in the Roanoke River basin show no discernible difference between the 2010 and 2045 Baseline conditions or the Proposed 2045 IBT, which is similar to the results summarized in Table 8-1.

TABLE 8-1
Lake Level Difference for Proposed 2045 IBT for Entire Simulation Period and during 2002 and 2007 Droughts

Scenario Comparison	Results (feet)	Roanoke River Reservoirs		
		Kerr	Gaston	Roanoke Rapids
2045 Baseline versus 2045 IBT	Average Baseline Elevation	299.8	200.0	132.0
	Average Elevation during 2002 Drought	284.8	200.0	132.0
	Average Difference with IBT during 2002 Drought	-0.2	0.0	0.0
	Average Elevation during 2007 Drought	284.6	200.0	132.0
	Average Difference with IBT during 2007 Drought	-0.1	0.0	0.0

FIGURE 8-1
Lake level changes for Proposed 2045 IBT for Kerr Lake – 2002 drought close-up.



8.2 Reservoir Release

Reservoir releases were also evaluated for each of the mainstem reservoirs in the Roanoke River basin for the period of record and during the period of extreme drought. As with lake level, there were no projected changes in releases for reservoirs upstream of Kerr Lake.

Table 8-2 summarizes differences in water releases for three reservoirs in the system: Kerr Lake, Lake Gaston, and Roanoke Rapids Reservoir during significant drought periods. Figure 8-2 depicts Kerr Lake modeling results using 2045 baseline water demands and the hydrologic record for the 2002 drought. These modeling results indicate that most of the future changes resulting from the IBT are predicted to occur as outflow from Kerr Lake. The average difference in release from Kerr Lake is approximately 5.0 mgd, which is

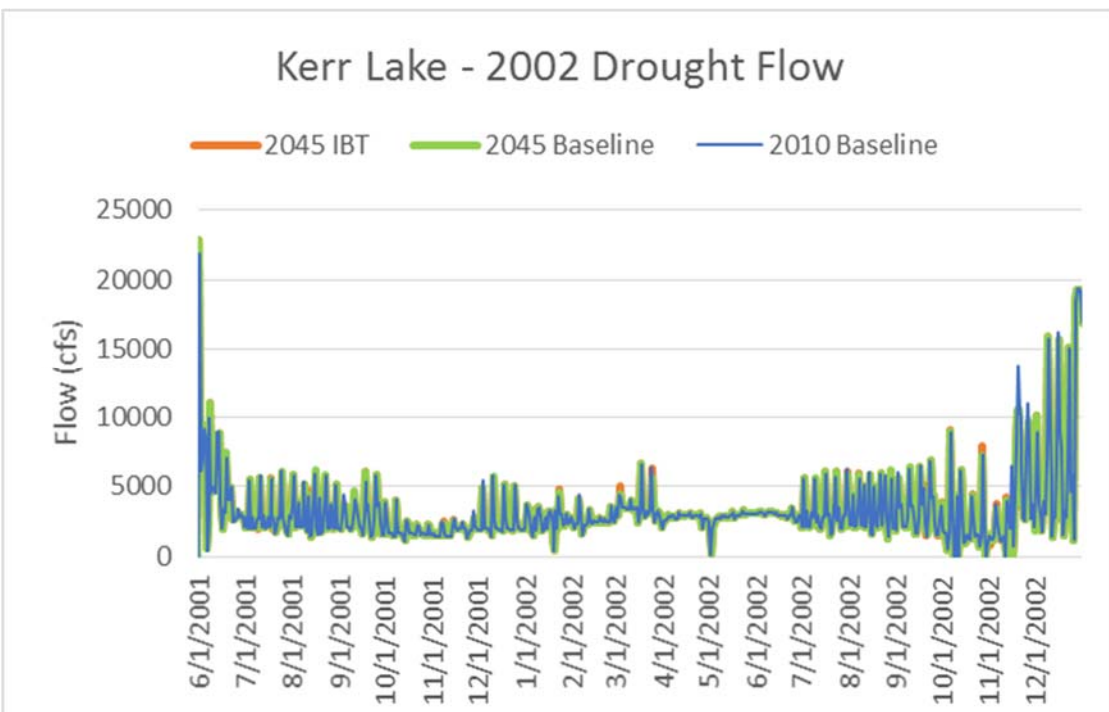
less than the average IBT. Since the model is balancing water, this is likely due to very small changes in lake elevation predicted as a result of the IBT (less than 0.05 foot, which is rounded to 0.0 in Table 8-1).

TABLE 8-2
Reservoir release differences for the entire simulation period and during the 2002 and 2007 droughts

Scenario Comparison	Results (cfs)	Roanoke River Reservoirs		
		Kerr	Gaston	Roanoke Rapids
2045 Baseline	Average Baseline Discharge	7,443.5	7,888.8	7,491.5
2045 Baseline	Average Discharge during 2002 Drought	3,077.3	3,247.8	2,921.0
2045 IBT	Average Discharge during 2002 Drought	3,082.3	3,252.7	2,956.2
	Average Difference during 2002 Drought	5.0	4.9	5.2
2045 Baseline	Average Discharge during 2007 Drought	2,691.2	2,989.8	2,681.7
2045 IBT	Average Discharge during 2007 Drought	2,683.1	2,981.7	2,673.6
	Average Difference during 2007 Drought	-8.1	-8.1	-8.1

Average baseline discharge has been calculated using the period of record
2002 Drought – 6/18/2002 through 10/15/2002
2007 Drought – 10/16/2007 through 3/10/2008

FIGURE 8-2
Comparison of Kerr Lake Releases for 2045 Scenarios during Extreme Drought Period of 2002



In summary, water quantity in the Roanoke River basin would likely not be impacted by the proposed IBT.

8.3 Hydropower

Hydropower, a renewable energy resource, is generated in the Roanoke River basin including from Kerr Lake. No hydropower projects are present in the receiving basin. The evaluation of potential impacts to hydropower using the updated RRBHM was similar to the evaluation of impacts to water quantity. Since no changes to lake levels or releases in reservoirs upstream of Kerr Lake would occur, hydropower issues were evaluated only for Kerr Lake, Lake Gaston, and Roanoke Rapids Reservoir (Table 8-3).

During the evaluation process for the 20 mgd allocation, the USACE determined that there would be a small reduction in power capability from Kerr Lake as a result of the withdrawal. The USACE could quantify that amount and the Partners are now compensating the USACE on an annual basis (USACE, 2005).

TABLE 8-3
Power Generation Differences for Proposed 2045 IBT for Entire Simulation Period and during the 2002 and 2007 Droughts

Scenario Comparison		Results (MWh)		
		Kerr Lake	Lake Gaston	Roanoke Rapids
2045 Baseline versus 2045 IBT	Average Baseline Power	471,074	342,548	348,778
	Average Power during 2002 Drought	185,668	161,193	159,085
	Average Difference during 2002 Drought with IBT	-680	-346	-372
	Average Power during 2007 Drought	342,152	249,559	253,131
	Average Difference during 2007 Drought with IBT	-378	-156	-168

Notes:

2002 Exceptional Drought Period – 6/18/2002 through 10/15/2002

2007 Exceptional Drought Period – 10/16/2007 through 3/10/2008

The total amount of water leaving the Roanoke River basin is considered as part of the cumulative impacts analysis. In addition to this IBT request, the City of Virginia Beach, Virginia has an intake in Lake Gaston and has permission to transfer a maximum of 60 mgd. The City of Virginia Beach also paid the USACE for its storage of 10,200 acre-feet in Kerr Lake and as part of its easement agreement for its intake in Lake Gaston reimburses Virginia Power for the lost energy production capability due to the transfer of water.

Future Water Supply Needs

Future water supply needs in the Roanoke River basin including agricultural, recreational, industrial, and hydropower uses are included in the updated RRBHM that was used for the analysis supporting the IBT request (Hydrologics, 2014). North Carolina local water supply plans for the year 2012 and water resources planning information from Virginia were used in the model development. This most recent version of the model is the most up-to-date compilation of all future water supply planning data in the basin. Significant water uses such as the transfer from Lake Gaston to Virginia Beach, hydropower, and release regimes to meet instream flow targets to protect the aquatic habitats in the lower reaches of the Roanoke River are all included in the model.

The model has been used by NCDWR for the purposes of assessing the ability of the watershed to meet future supply needs within the Roanoke River basin. Results show that the river basin, given its large size and water storage, is able to meet future water needs through the planning period. Additional analysis conducted to evaluate the IBT request and presented in the EA and associated FONSI support this conclusion.

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Appendix A
Finding of No Significant Impact - IBT

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NCDENR
North Carolina Department of Environment and Natural Resources

Pat McCrory
Governor

Donald R. van der Vaart
Secretary

FINDING OF NO SIGNIFICANT IMPACT (FONSI)

Kerr Lake Regional Water System Interbasin Transfer (IBT) Request
Warren, Vance, Franklin, Granville Counties, North Carolina

The North Carolina Environmental Policy Act (G.S. §113A) requires that the Division of Water Resources determine whether a proposed major agency action will significantly affect the environment. The Kerr Lake Regional Water System (KLRWS) Interbasin Transfer (IBT) is such a major action. The proposed project will transfer 14.2 million gallons of water per day (mgd), calculated as the average day of a (maximum) calendar month, from the Roanoke River IBT basin to the Tar River (10.7 mgd), Fishing Creek (1.7 mgd), and Neuse River (1.8 mgd) IBT basins. This transfer volume represents the projected 2045 demands of the existing customer base and anticipated growth of the service area. The current grandfathered IBT for the KLRWS is 10 mgd, calculated as a maximum day, which is equivalent to 9.7 mgd, calculated as the average of a calendar month.

The KLRWS is a large regional system that currently provides water directly or indirectly to municipal and county systems in northeastern North Carolina. The water supply for the system is John H. Kerr Reservoir (Kerr Lake) on the Roanoke River. The owners of the KLRWS and primary bulk customers served by the system are the City of Henderson, the City of Oxford, and Warren County, known as the "Partners." The City of Henderson is the majority partner and operates and manages the water treatment plant for the water system. The City of Henderson also currently sells water to secondary bulk customers that include communities in Warren, Vance, Franklin, and Granville Counties. These include Stovall, Warrenton, Norlina, Vance County, Kittrell, and Franklin County. Future sales will occur from Oxford to South Granville Water and Sewer Authority (SGWSA) for use by Creedmoor and its customer, Wilton. Franklin County now owns the Youngsville water system and also sells water to Bunn and Lake Royale.

Kerr Lake is managed by the United States Army Corps of Engineers (USACE) for many purposes including water supply. In 2005, the USACE granted KLRWS a 20 mgd annual average day storage allocation in Kerr Lake. This demand is not projected to be exceeded by the water system through 2060.

In order to determine whether the KLRWS IBT will cause significant environmental impacts, an environmental assessment has been prepared. The environmental assessment is attached. It contains detailed information on the key issues, including a detailed description of the proposed project, and potential environmental impacts with proposed mitigation measures. The following is a summary of the environmental impact analysis conducted:

- No direct impacts to any land or water resources are anticipated from this proposed project because no construction activities or additional infrastructure are needed for the proposed IBT. A summary of secondary and cumulative impacts (SCI) are included in Chapter 5 and mitigation efforts associated with any potential secondary and cumulative impacts are detailed in Chapter 6.

- The source and receiving basins detrimental cumulative effects were analyzed using a hydrologic model developed for the Roanoke River basin. The model is used to assess the potential effects of any water withdrawal, discharge or transfer activity. Water supply data related to water systems in these models is sourced from the Division of Water Resources Local Water Supply Plans (LWSP). The applicants have all submitted updated LWSPs and this data was used in the hydrologic model.

- Hydrologic modeling results presented in the EA effectively demonstrate that the proposed water supply project will have no significant detrimental effects on the water levels in Kerr Lake. These modeling efforts included agricultural, recreational, and industrial uses, as well as upstream and downstream water supply demands from water systems. The results from the hydrologic modeling also demonstrate that the proposed project will cause no significant alterations of releases into the Roanoke River downstream of John H. Kerr Reservoir Dam. No operational changes will be needed on any of the downstream reservoirs to maintain minimum flow targets. Due to these results, the proposed project is not expected to effect downstream flows in the Roanoke River. Therefore, no direct impacts are expected from the preferred alternative as described above.

As evidenced in the environmental assessment, the KLRWS has been in full compliance with their current grandfathered allowable IBT. The preferred alternative was selected because it meets the demonstrated water supply needs while minimizing any potential impacts resulting from the IBT. On the basis of the analysis conducted for the environmental assessment, it has been concluded that the KLRWS IBT Certificate will not have a significant adverse effect on the quality of the environment. No environmental impact statement (EIS) will be prepared and this FONSI completes the environmental review record. The FONSI and environmental assessment shall be available for inspection and comment for 30 days at the State Clearinghouse.

Summary of FONSI for publication in the Environmental Bulletin: After completion of an environmental assessment under G.S. 113A, a FONSI has been made in the case of the Kerr Lake Regional Water System Interbasin Transfer Certificate. Information supporting the need for the proposed project was reviewed, along with relative impacts, other alternative approaches and mitigating measures.

T. Fransen 1/16/15

Tom Fransen (Date)
Chief, Water Planning Section
Division of Water Resources

Rec'd 12/29/14

D-65

NCDENR

North Carolina Department of Environment and Natural Resources
Division of Water Resources

Pat McCrory
Governor

John E. Skvarla III
Secretary

December 19, 2014

Mr. Eric Williams
180 Beckford Drive
Henderson, North Carolina 27536

Re: **Extension of Authorization to Construct**
Kerr Lake WTP Additions
Water System No. NC0291010, Vance County

Dear Mr. Williams:

This letter is in response to a request for an Extension of the Authorization to Construct for **Kerr Lake WTP Additions, Serial No. 05-01344.** The Authorization to Construct is extended and will expire on December 19, 2016.

The Extension of the Authorization to Construct is valid only if the site conditions and the previously approved engineering parameters have not changed, as required by 15A NCAC 18C .0305 (a). The Extension of the Authorization to Construct and the engineering plans and specifications approval letter shall be posted at the primary entrance of the job site before and during construction.

Approval must be secured from the Department before any construction or installation if:

- Deviation from the approved engineering plans and specifications is necessary; or
- There are changes in site conditions affecting capacity, hydraulic conditions, operating units, the function of water treatment processes, the quality of water to be delivered, or conditions imposed by the Department in any approval letters.

Upon completion of the construction or modification and in accordance with Rule .0303, the applicant shall submit a certification statement signed and sealed by a registered professional engineer stating that construction was completed in accordance with approved engineering plans and specifications, including any provisions stipulated in the Department's engineering plan and specification approval letter. Prior to Final Approval, the applicant shall submit a signed certification stating that the requirements in 15A NCAC 18C .0307 (d) and (e) have been satisfied and if applicable, a completed application for an Operating permit and fee. Once the certification statements and operating permit application and fee, if applicable, are received and determined adequate, the Department will grant Final Approval in accordance with Rule .0309 (a). Therefore, no construction, alteration, or expansion of a water system shall be placed into service until Final Approval has been issued by the Department.

If we can be of further assistance, please call (919) 707-9100.

Sincerely,

Siraj Chohan, P.E.
Division of Water Resources

SMC/tk
cc: Allen Hardy, Raleigh Regional Office
EE&T Inc

1634 Mail Service Center, Raleigh, North Carolina 27699-1634
Phone: 919-707-9100 \ FAX: 919-715-4374 \ Lab Form FAX: 919-715-6637 \ Internet: www.ncwater.org/pws/

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Appendix B
Water Shortage Response Plan

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ORDINANCE 11—04

Council Member Peace-Jenkins introduced the following Ordinance which was seconded by Council Member Daye and read:

WATER SHORTAGE RESPONSE ORDINANCE

The City Council of the City of Henderson, North Carolina doth ordain:

Section 1. That Chapter 15B of the City Code be amended to read as follows:

"CHAPTER 15B – WATER SHORTAGE RESPONSE ORDINANCE

Sec. 15B-1. Purpose.
The purpose of this chapter is to provide for the declaration of official phases of water supply shortage situations and the implementation of voluntary and mandatory water conservation measures throughout the city and for all of its water customers in the event a shortage is declared.
(Ord. of 9-24-07(1), § 1)

Sec. 15B-2. Definitions.

Allotment, as the term is used in this chapter, shall mean the maximum quantity of water allowed for each customer over any applicable period as established in the water rationing provisions of this chapter.

Any water, as the term is used in this chapter, shall mean any type of water, including fresh water, wastewater, or reclaimed water.

City Manager, as the term is used in this chapter, shall mean the City Manager of the City of Henderson, or in his absence, the Assistant City Manager (or other designee of the City Manager).

Customer, as the term is used in this chapter, shall mean any person using water for any purpose from the City of Henderson's water distribution system or from lines under the City's control and for which either a regular charge is made or, in this case of bulk sales, a cash charge is make at the site of delivery.

Emergency, as the term is used in this chapter, shall mean that water supplies are below the level necessary, to meet normal needs and that serious shortages exist in the area.

Excess use, as the term is used in this chapter, shall mean the usage of water by a water customer in excess of the water allotment provided under the water rationing provisions of this chapter for that customer, over and applicable period.

Fresh water, as the term is used in this chapter, shall mean water withdrawn from surface or groundwater that has not been previously used.

Mandatory conservation, as the term is used in this chapter, shall mean that raw water supplies from the Kerr Lake Regional Water System are consistently below seasonal averages, and if they continue to decline, may not be adequate to meet normal needs.

Non-residential customer, as the term is used in this chapter, shall mean commercial, industrial, institutional, public and all other such users, with the exception of hospitals and health care facilities.

Rationing, as the term is used in this chapter, shall mean procedures established to provide for the equitable distribution of critically-limited water supplies, in order to balance demand and limited available supplies, and to assure that sufficient water is available to preserve public health and safety.

Residential customer, as the term is used in this chapter, shall mean any customers who receive water service for a single or multi-family dwelling unit. The term residential customer does not include educational or other institutions, hotel, motel, or similar commercial establishments.

Service interruption, as the term is used in this chapter, shall mean the temporary suspension of water supply, or reduction of pressure below that required for adequate supply, to any customer, portion of a water supply, or entire system.

Voluntary conservation, as the term is used in this chapter, shall mean that conditions exist which indicate the potential for serious water supply shortages.

Waste of water, as the term is used in this chapter, includes, but is not limited to (1) permittin water to escape down a gutter, ditch, or other surface drain, or (2) failure to repair a controllable leak of water due to defective plumbing.

Wastewater, as the term is used in this chapter, shall mean water, which has been previously used for industrial, municipal, domestic, or other purpose, and has not been returned to the surface or groundwater source.

Water, as the term is used in this chapter, shall mean water available to the City of Henderson from the Kerr Lake Regional Water System by virtue of its water rights or contract, or any treated water introduced by the City of Henderson into its water distribution system, including water offered for sale.

Water use classes, as the term is used in this chapter, shall be established as follows:

CLASS 1 ESSENTIAL WATER USES:

Domestic use:
• Water necessary to sustain human life and the lives of domestic pets, and to maintain minimum standards of hygiene and sanitation.

Health care facilities:
• Patient care and rehabilitation, including swimming pools used for patient care and rehabilitation.

Public use:
• Fire hydrants
1. Fire fighting.
2. Certain testing and drills by the fire department if performed in the interest of public safety and if approved by the city manager.

•Flushing of sewers and hydrants: As needed to ensure public health and safety and if approved by the city manager.

CLASS 2 SOCIALLY OR ECONOMICALLY IMPORTANT USES OF WATER:

All domestic uses other than those included in classes 1 and 3:
• Home water use including kitchen, bathroom and laundry use.
• Minimal watering of vegetable gardens.
• Watering of trees where necessary to preserve them.

Commercial, agricultural, industrial and institutional uses:
• Outdoor commercial watering (public or private) using conservation measures and to the extent that sources of water other than fresh water are not available to use.
• Irrigation for commercial vegetable gardens and fruit orchards or the maintenance c livestock.
• Watering by commercial nurseries at a minimum level necessary to maintain stock.
• Water use by arboretums and public gardens or national, stare, or regional significance where necessary to preserve specimens.
• Use of fresh water at a minimum rate necessary to implement vegetation following earth moving, where such vegetation is required by law or regulation.
• Watering of golf course greens.
• Filling and operation of swimming pools:

1. Residential pools which serve more than twenty-five (25) dwelling units.
2. Pools used by health care facilities for patient care and rehabilitation.
3. Municipal pools.

• Commercial car and truck washes.
• Commercial laundromats.
• Restaurants, clubs, and eating places.
• Air conditioning:

1. Refilling for start up at the beginning of the cooling season.
2. Make-up of water during the cooling season.
3. Refilling specifically approved by health officials and the municipal governing body, where the system has been drained for health protection or repair purposes.

• Schools, churches, motels/hotels and similar commercial establishments.

CLASS 3 NONESSENTIAL USES OF WATER:

Ornamental purposes:
• Fountains, reflecting pools, and artificial waterfalls.

Outdoor noncommercial watering (public or private):
• Gardens, lawns, parks, golf courses (except greens), playing fields and other recreational areas.
• Filling and operation of recreational swimming pools which serve fewer than twenty-five (25) dwellings.
• Noncommercial washing motor vehicles.
• Serving water in restaurants, clubs, or eating places except by specific request.
• Air conditioning: refilling cooling towers after draining except as specified in class 1.

Public use:
• Fire hydrants: any purpose, including use of sprinkler caps and testing fire apparatus and for fire department drills, except as listed class 1.
• Flushing of sewers and hydrants except as listed in class 1.
(Ord. of 9-24-07(1), § 1)

Sec. 15B-3. Declaration of voluntary conservation.

Whenever the City Manager finds the water level in Kerr Lake is consistently at elevation 294, he shall declare that Voluntary Conservation conditions exist, and that the Director of the Kerr Lake Regional Water System shall, on a daily basis, monitor the lake level and the water use demand.

In addition, the City Manager shall call upon all water customers to employ voluntary water conservation measures within 48 hours of receiving notice (see Sec. 15B-13) to limit water use (especially Class 3 uses) and eliminate the waste of water. The goal for water reduction shall be 5%.

Sec. 15B-4. Declaration of mandatory conservation.

Whenever the City Manager finds the water level in Kerr Lake is consistently at elevation 289, he shall declare that Mandatory Conservation conditions exist. This implies that lake level is nearing a level where insufficient water can enter the raw water intake.

The City Manager shall continue to encourage voluntary water conservation measures for its customers as defined under the Voluntary Conservation declaration, and shall further require mandatory measures be put in place, such as a ban be imposed on all Class 3 uses for the duration of the shortage until it is declared ended by the City Manager. The goal for water reduction shall be 10%.

Sec. 15B-5. Declaration of a water shortage emergency.

Whenever the City Manager finds that water level in Kerr Lake has dropped to elevation 284 or below, and/or that a serious shortage exists due to other reasons, he shall declare that a water shortage Emergency exists. It would be recommended that the City identify all Class 1, Essential Uses, in specific, and make them targets for voluntary conservation initiatives.

The Kerr Lake Regional Water System shall require mandatory measures be put in place, such as a ban be imposed on all Class 2 and Class 3 uses for the duration of the shortage. The goal for water reduction shall be 40%. These restrictions should be continued until the emergency is declared ended.

In adopting such restrictions, the City Manager may take into consideration the following priorities of its obligations:

(1) To public health and fire protection;
(2) To those water users residing within the city limits of the city;
(3) To those to whom the city has contracted obligations for supplying water; and
(4) To other users located outside the city limits of the City of Henderson.

(Ord. of 9-24-07(1), § 1)

Sec. 15B-6. Declaration of mandatory rationing.

Whenever the City Manager finds that water level in Kerr Lake has dropped to elevation 280, declared a Water Shortage Emergency, and finds a need to provide for the equitable distribution of critically-limited water supplies, in order to balance demand on limited available supplies, and to assure that sufficient water is available to preserve public health and safety, he shall call for mandatory rationing by its water users until the emergency is declared ended.

During this emergency situation, the amount of water could be reduced by fifty percent (50%) or more. This amount shall be determined by the City Council of the City of Henderson.

Sec. 15B-7. Objectives of mandatory rationing.

An ordinance that provides for mandatory rationing shall state findings that:

(1) It is imperative that water customers achieve an immediate further reduction in water use in order to extend existing water supplies and at the same time, assure that sufficient water is available to preserve the public health and sanitation and to provide fire protection service.

(2) The immediate further reduction in water usage is another step along a continuum of responses to the present water supply shortage. Should shortage continue further reductions in usage may be required. It must be emphasized that the additional usage reduction in the rationed area is a valid and attainable goal reflective of the conditions that currently exist.

(3) It is imperative that water customers achieve an immediate further reduction in water use in order to extend existing water supplies and at the same time, assure that sufficient water is available to preserve the public health and sanitation and to provide fire protection service.

(4) The plan provides for equitable reductions in water usage and for equal sacrifice on the part of each type of water customer. The success of this chapter depends on the cooperation of all water customers in the emergency area.

(Ord. of 9-24-07(1), § 1)

Sec. 15B-8. Mandatory rationing for residential users.

(a) Unless the city council otherwise provides, mandatory rationing shall include the following for metered residential water customers.

(1) The number of permanent residents in each dwelling unit (household) will determine the amount of water that each household will be allowed.

(2) Each dwelling unit (household) shall be allotted one hundred thirty (130) gallons per day for each resident of the household.

(3) Residential water customers are required to provide city and utility personnel with reasonable access to read meters as necessary to this rationing declaration. Where access is not readily available, all reasonable efforts to contact customers in order to arrange for access to read meters shall be made. In the even a water customer does not allow entry to

read the meter after reasonable efforts to arrange for such access, the dwelling unit (household) allotment will be reduced to one hundred (100) gallons per day.

(4) a. If it is found that the residential water allotment provided under this chapter would created an extraordinary hardship for individual customers, as in the case of special health-related requirements, a revised allotment or variance for the particular customer may be established;

b. Any person aggrieved by a decision relating to such an exemption or variance may file an opposed to with the city manager (or clerk) in accordance with the city's normal administrative procedures and the city manager can deny, modify, or grant any variance on such appeal.

(Ord. of 9-24-07(1), § 1)

Sec. 15B-9. Mandatory rationing for nonresidential water users.

(a) Nonresidential customers include commercial, industrial, public and all other such users with the exception of hospitals and health care facilities.

(b) Nonresidential water customers shall further reduce their water usage to sixty-five (65) gallons per person per day or to fifty (50) percent of use levels during last metered recording.

(c) It is the primary responsibility of each nonresidential water customer to meet the mandated water use reduction goal in whatever manner possible, including limitation of operating hours or days if necessary.

(d) The city will establish a water allotment for each nonresidential water customer, based upon a required further reduction water usage from the rate of water used by the customer at the last recorded use level.

(e) Each nonresidential water user shall provide access to city's personnel for the purpose of meter reading and monitoring of compliance with this chapter. All reasonable efforts will be made to contact customers to arrange for access.

Sec. 15B-10. Mandatory rationing for hospitals and health care facilities.

Unless the city council otherwise provides, mandatory rationing for the hospitals and health care facilities shall include the following:

(1) Hospitals and health care facilities shall comply with all restriction imposed on residential and nonresidential water customers as may be applicable to each individual institution, to the extent compliance will not endanger the health of the patients or residents of the institution.

(2) Each hospital or health care facility shall survey its water usage patterns and requirements and implement such additional conservation measures as may be possible without endangering the health of its patients or residents to achieve a further reduction in the institution's water usage..

Sec. 15B-11. Variances.

The City of Henderson understands that water restrictions can cause economic hardships on certain portions of its water customers: additionally, the restriction could be infeasible for others that have implemented water use reduction strategies into their daily practices prior to drought conditions being in place.

(1) If the mandated further reduction in water usage cannot be obtained without imposing extraordinary hardship which threatens health and safety, the nonresidential customer may apply to the City Manager for a variance. For these purposes "extraordinary hardship" means a permanent damage to property or an economic loss which is substantially more severe than the sacrifices borne by other water users subject to this water rationing ordinance. If the further reduction would cause an extraordinary

hardship or threaten health or safety, a variance may be granted by the city manager, and a revised water use reduction requirement for the particular customer may be established.

(2) Applications for water use variance requests are available from the City Hall. All applications must be submitted in writing to City Hall for review by the City Manager or his or her designee. A decision to approve or deny individual variance requests will be determined within two weeks of submittal after careful consideration of the following criteria: impact on water demand, expected duration, alternative source options, social and economic importance, purpose (i.e. necessary use of drinking water), the prevention of structural damage, and the protection of health and safety.

(3) Decisions rendered by the City Manager may be appealed to the City Council if suc appeal is made in writing and delivered to the City Manager's office within five (5) days of the City Manager's decision on the variance request.

Sec. 15B-12. Notices.

The following notification methods will be used to inform water system employees and customers of a water shortage declaration: employee e-mail announcements, notices posted at City Hall, notices in water bills. Required water shortage response measures will be communicated through *The Daily Dispatch*, PSA announcements on local radio stations and the City's website (http://www.Hendersonnc.org/). Declaration of emergency water restrictions or water rationing will be communicated to all customers by local media, including the City's website.

Sec. 15B-13. Conservation recommendations.

In the event of a water shortage, customers shall also be encouraged to adopt the following measures:

(a) *Indoor residential use:*

(1) *Conservation for voluntary conservation phases:*

a. Use dishwashers only when they are full. Washing dishes by hand (don't let the tap run!) saves about twenty-five (25) gallons.

b. Adjust water level on clothes washing machines, if possible. Use full load only, of not adjustable.

c. Turn off faucets while brushing teeth, etc. saves about five (5) gallons per day.

d. Reduce water used per flush by installing toilet tank displacement inserts. A plastic jug may often be used as an alternative. DO NOT USE BRICKS--They disintegrate when soaked and the resulting grit hinders closing of the flap valve.

e. Do not use the toilet as a trash can.

f. Use sink and tub stoppers to avoid wasting water.

g. Keep a bottle of chilled water in the refrigerator for drinking.

h. Find and fix leaks in faucets and water using appliances. Faucets can usually be fixed cheaply and quickly by replacing washers.

i. Learn to read your water meter so you can judge how much water you use and what difference conservation makes.

j. Take shorter showers and shallow baths. Saves about twenty-five (25) gallons.

k. Reduce the number of toilet flushes per day. Each flush uses about five (5) gallons (two to three (2--3), if you have water saving toilets).

l. Don't use a garbage disposal.

m. Use non-phosphate detergent and save laundry water for lawns and plants.

(2) *Conservation for emergency conservation or rationing phase (In addition to measures listed above).*

a. Turn off shower while soaping up.

b. Use disposable eating utensils.

(b) *Outdoor residential use.*

(1) *Conservation for normal conditions and voluntary conservation phase:*

a. Lawns:

1. Water before 10:00 a.m. to prevent evaporation that occurs during the hottest part of the day. Morning is better than evening, when the dampness encourages growth of fungus.

2. Water only when lawn shows signs of wilt. Grass that springs back when stepped on does not need water.

3. Water thoroughly, not frequently: long enough to soak roots. A light sprinkling evaporates quickly and encourages shallow root systems. Water slowly to avoid runoff.

4. Don't let the sprinkler run any longer than necessary. In an hour, six hundred (600) gallons can be wasted.

5. Allow maximum of one (1) inch of water per week on your lawn. To measure, place cake tins outside to collect rain and water from sprinklers.

6. Use pistol-grip nozzles on hoses to avoid waste when watering flowers and shrubs.

7. Aerate lawns by punching holes six (6) inches apart. This allows water to reach roots rather than run off surfaces.

8. Position sprinklers to water the lawn, not the pavement.

9. Avoid watering on windy days when the wind not only blows water off target, but also causes excess evaporation.

10. Keep sprinkler heads clean to prevent uneven watering.

11. Adjust hose to simulate gentle rain. Sprinklers that produce a fine mist waste water through evaporation.

12. Know how to turn off an automatic sprinkler system in case of rain.

13. Use an alarm clock or stove timer to remind you to shut off sprinklers that don't have timers.

b. Vegetables and flower gardens:

1. Water deeply, slowly and weekly. Most vegetables require moisture to a depth of six (6) to eight (8) inches.

2. Keep soil loose so water can penetrate easily.

3. Keep weeks out to reduce competition for water.

4. Put the water where you want it and avoid evaporation by using soil-soakers or slow running hoses, not sprinklers.

c. Trees and shrubs:

1. Water deeply using a soil-soaker or drip-irrigation.

2. Water only when needed. Check the depth of soil dryness by digging with a trowel.

3. Mulch to reduce evaporation. A two (2) inch to three (3) inch layer of wood chips, pine needles, grass clippings, or straw keeps the soil cool in summer.

4. Dig troughs around plants to catch and retain water.

5. Water trees growing in full sun more often than those in shade.

6. Do not use sprinklers. Apply water directly at base.

7. Do not fertilize during the summer. Fertilizing increases a plant's need for water.

8. Postpone planting until fall or spring when there is generally less need for water.

9. Install trickle-drip irrigation systems close to the roots of your plants. By dripping water slowly, the system doesn't spray water in to the air. Use soil probes for large trees.

10. Water when cloudy, at night, or even when a light rain is falling.

d. Miscellaneous.

1. Do not allow children to play with hose or sprinklers.

2. Limit car washing.

3. Be ready to catch rainfall that occurs. Place containers under drain sprouts.

4. Use leftover household water if available.

5. Consider delaying the seeding or sodding of new lawns.

6. Determine the amount of water being used outdoors by comparing water bills for summer and winter.

(2) *Conservation for mandatory conservation phase (in addition to measures listed above).*

a. Vegetable gardens and food trees should be given minimal amounts of water on an individual basis only.

b. Do not water lawns and inedible plants.

c. Do not use sprinklers.

Most outdoor watering is prohibited under emergency conservation conditions.

(c) *Hospital and health care facility use:*

(1) Reduce laundry usage or services by changing the linens, etc. only when necessary to preserve the health of patients or residents.

(2) Use disposable food service items.

(3) Eliminated, postpone, or reduce, as they may be appropriate, elective surgical procedures during the period of emergency.

(d) *Industrial use.*

(1) Identify and repair all leaky fixtures and water-using equipment. Give special attention to equipment connected directly to waterlines, such as processing machines, steam-using machines, washing machines, water-cooled air conditioners, and furnaces.

(2) Assure that valves and solenoids that control water flows are shut off completely when the water-using cycle is not engaged.

(3) Adjust water-using equipment to use the minimum amount of water required to achieve its stated purpose.

(4) Shorten rinse cycles for laundry machines as much as possible; implement lower water levels wherever possible.

(5) For processing, cooling, and other uses, either re-use water or use water from sources that would not adversely affect public water supplies.

(6) Advise employees, students, patients, customers, and other users not to flush toilets unnecessarily. Install toilet tank displacement inserts; place flow restrictors in showerheads and faucets; close down automatic flushes overnight.

(7) Install automatic flushing valves to use as little water as possible or to cycle at longer intervals.

(8) Place water-saving posters and literature where employees, students, patients, customers', etc. will have access to them.

(9) Check meters on a frequent basis to determine consumptive patterns.

(10) Review usage patterns to see where other savings can be made.

(Ord. of 9-24-07(1), § 1)

Sec. 15B-14. Enforcement of water rationing.

(a) The city manager or the water utility department will have responsibility for monitoring of compliance with the water rationing ordinance.

(b) The following provisions shall govern the implementation of temporary service interruptions:

(1) In order to effectuate compliance with this ordinance, the City is hereby authorized to plan and implement temporary service interruption to all or part of its water supply system, as may be deemed appropriate, when any/or all of the following conditions are determined to exist:

a. The mandated reduction in system-wide water usage has been achieved; and/or

b. The mandated reduction in system-wide water usage has been achieved, but has failed to have a significant impact in extending limited water supplies; and/or

c. Temporary service interruptions are necessary in order to further extend limited and/or dwindling water supplies.

(2) In the event it is determined that temporary service interruptions are necessary, the city shall notify its customers through the public media (newspapers, radio, and television), at least one (1) day prior to the temporary service interruptions, that a planned, temporary service interruption is to be imposed. Such notice shall:

a. State the day or days when the planned, temporary service interruption will occur;

b. State the time(s) when such planned, temporary service interruptions will commence and the time(s) such interruption will cease;

c. State whether the planned, temporary service interruptions are to be imposed on the entire system, or part thereof, and, if only part(s) of the system, which parts will experience planned, temporary service interruptions.

(3) The City should advise by a general notice addressed to customers within the areas affected by planned, temporary service interruptions how to treat any water received from the system for human consumption during the period(s) of such interruptions and for such additional time as may be necessary until full pressure is restored to the system.

(c) The provisions of the water shortage response ordinance will be enforced by City of Henderson personnel and local law enforcement. Violators may be reported on the City's phone line or by written notice to the Mayor, City Manager, or Public Utilities Department.

(d) Meter reading schedules are authorized to be altered to assure adequate monitoring of compliance with this ordinance.

(e) Any residential or nonresidential water customer who exceeds the allotments established pursuant to this water rationing will be subject to the following excess-use administrative penalties.

(1) *Excess use administrative penalties* will be collected, computed in accordance wit the following schedule:
Each violation $100.00

(f) In addition to the excess use administrative penalty, noncompliance with the water rationing provisions of this chapter will result in the following:

(1) For the first excess use, a warning of possible discontinuation shall be issued to the customer.

(2) For the second or subsequent excess use, service to the customer may be interrupted or shut off for a period not to exceed forty-eight (48) hours, or, if the customer provides access, a flow restrictor may be installed in the customer's service line for the duration of the emergency. The cost incurred to interrupt or shut off and reinstate service, or to install and remove a flow restrictor, shall be assessed to the water customer. Before service to an individual may be terminated under this provision, actual notice of the intent to discontinue shall be given, which shall include notice that the customer may appear at designated time and place (within twenty-four (24) hours) for an informal hearing to show why service should not be discontinued.

Sec. 15B-15. Shortage water rates.

Upon the declaration of a water supply shortage as provided in sections 15B-3, 15B-4 or 15B-. hereof, the city council of the city shall have the power to adopt shortage water rates by ordinance designed to conserve water supplies. Such rates may provide for, but not be limited to:

(1) Higher charges per unit for increasing usage (increasing block rates);

(2) Uniform charges for water usage per unit of used (uniform unit rate);

(3) Extra charges for use in excess of a specified level (excess demand surcharge); or

(4) Discounts for conserving water beyond specific levels. Nothing herein shall be construed to imply any limitations on the city's general rate adoption and/or amendment authority.

(Ord. of 9-24-07(1), § 1)

Sec. 15B-16. Regulations.

Any person who violated the provisions of this chapter, who fails to carry out the responsibilities imposed by this chapter, or who impedes or interferes with any action undertaken or ordered pursuant to this chapter shall be subject to the following additional consequences:

(1) If the mayor, city manager, director of public works, or other city official or officials charged with implementation and enforcement of this ordinance or a water supply shortage resolution learns of any violation of any water use restriction imposed pursuant to this ordinance, a written notice of the record shall be affixed to the property where the violation occurred and mailed to the customer and to any other person known to the city who is responsible for the violation or its correction. Said notice shall describe the violation and order that is to be corrected, cured, or abated immediately or within such specified time as the city determines is reasonable under the circumstances. If the order is not complied with, the city may terminate water service to the customer subject the following procedures:

a. The city shall give the customer notice by mail that, due to the violation, water services will be discontinued with a specified time and that the customer will have the opportunity to appeal the termination by requesting a hearing scheduled before the city manager.

b. If such a hearing is requested by the customer charged with the violation, he or she shall be given a full opportunity to be heard before termination is ordered; and,

c: The city manager shall make findings of fact and order whether service should continue or be terminated.

(2) A fee of fifty dollars ($50.00) shall be paid for the reconnection of any water service terminated pursuant to subsection (a). In the event of subsequent violation the reconnection fee shall be two hundred dollars ($200.00) for the second violation and three hundred dollars ($300.00) for each additional violation.

(3) Any customers may also be charged with any willful violation of this ordinance and prosecuted in the General Courts of Justice. Any person so charged and found guilty of violating the provisions of this chapter shall be guilty of a misdemeanor. Each day's violation shall constitute a separate offense. The penalty for violation shall be a maximum fine of fifty ($50.00) and/or imprisonment for not more than thirty (30) days.

(Ord. of 9-24-07(1), § 1)

Sec. 15B-17. Civil penalties.

In addition to criminal prosecution, violation of this chapter may subject the offender to civil penalties in the amount of twenty-five ($25.00) per day, collectible in a civil action in the nature of debt.

(Ord. of 9-24-07(1), § 1)

Sec. 15B-18. Appeals.

Any customer or other person aggrieved by a decision or action imposing an excess-use civil penalty or other remedy for noncompliance with the requirements of this ordinance may appeal in accordance with the following provisions:

(1) The customer or aggrieved party shall file a letter of appeal to city manager within (10) days of action to rebut the finding of a violation, or provide evidence of circumstances beyond the customer's control that resulted in the violation.

(2) A record of evidence regarding disputed violations shall be kept, and a written notice of the city manager's final decision and action in such cases shall be provided to the customer or aggrieved party.

(Ord. of 9-24-07(1), § 1)

Sec. 15B-19. Return to Normal.

When water shortage conditions have abated and the situation is returning to normal, wat conservation measures employed during each phase should be decreased in reverse order of implementation. Permanent measures directed toward long-term monitoring and conservation should be implemented or continued so that the City will be in a better position to prevent shortages and respond to recurring water shortage conditions.

Sec. 15B-20. Effectiveness.

The effectiveness of the City of Henderson water shortage response plan will be determined by comparing the stated water conservation goals with observed water use reduction data. Other factors to be considered include frequency of plan activation, any problem periods without activation, total number of violation citations, desired reductions attained and evaluation of demand reductions compared to the previous year's seasonal data.

Sec. 15B-21. Revision.

The water shortage response plan will be reviewed and revised as needed to adapt to new circumstances affecting water supply and demand, following implementation of emergency restrictions, and at a minimum of every five years. Further, the Kerr Lake Regional Water Advisory Board and the staff of the City of Henderson will review procedures following each emergency or rationing stage to recommend any necessary improvements to the plan to the Henderson City Council. The City Manager is responsible for initiating all subsequent revisior to be considered by the City Council.

Sec. 15B-22. Severability.

If any provision of this chapter is declared unconstitutional, or the application thereof to any person or circumstance is held invalid, the constitutionality of the remainder of the ordinance and its applicability to other person and circumstances shall not be affected thereby.
(Ord. of 9-24-07(1), § 1)"

Section 2. Prior to adoption of this Ordinance, public comment will be permitted as follows:

Customers will have multiple opportunities to comment on the provisions of the Water Shortage Response Ordinance. First, a draft ordinance will be will be available at City Hall for customers to view. A notice will be included in customer water bills notifying them of such. All subsequent revisions to the draft ordinance will be printed and made available at least 30 days prior to an adoption vote by Henderson City Council.

Section 3. The foregoing Ordinance shall be in full force and effect from and after the date of its passage.

The foregoing Ordinance 11—04, upon motion of Council Member Peace-Jenkins and seconded b Council Member Daye, and having been submitted to a roll call vote and received the following vote and was APPROVED on this the 14th day of March, 2011: YES: Inscoe, Rainey, Peace-Jenkins, Daeke, Davis, Daye and Coffey. NO: None. ABSTAIN: None. ABSENT: None.

James D. O'Geary, Mayor

ATTEST:

Esther J. McCrackin, City Clerk

Approved to Legal Form:

John H. Zollicoffer, Jr., City Attorney

Reference: Minute Book 42, p. 68.
CAF 10—166- Reference: Minute Book 41, pg 707
Res 10—110 – Reference Resolution Book 1, pg 679

STATE OF NORTH CAROLINA
CITY OF HENDERSON

I, Esther J. McCrackin, the duly appointed, qualified City Clerk of the City of Henderson, do hereby certify the foregoing Ordinance is a true and exact copy of *Ordinance 11—04,* A Water Shortage Response Ordinance, adopted by the Henderson, City Council in Regular Session on 14 March 2011 *(See Minute Book 42, p.68).* This Ordinance is recorded in *Ordinance Book # 8,* p. 211.

Witness my hand and corporate seal of the City, this 14th day of March 2011.

Esther J. McCrackin
City Clerk
City of Henderson, North Carolina